ENGIN SOFT

Newsletter

English Special Issue 2006

EnginSoft Users' Meeting 2006
CAE Technologies in Industry
Stezzano (BG), 9-10 November

modeFRONTIER
International Users' Meeting 2006
Trieste, 28-29 September

Optimization technologies
applied to Mechatronics

Research: at the heart of innovation

EnginSoft's Mission: Education

Pressure Die Casting Machines: Setup and Optimization of the Process using modeFRONTIER

New shareholder for LINFLOW

New partnership with DYNARDO

New MAGMAfrontier module

Optimization of Gas Turbine Combustors

Optimization Techniques Applied to the Design of Gas Turbine Blades Cooling Systems

Structural Design of the Olympic Torch Turin 2006

EnginSoft promotes European modeFRONTIER Network Community

modeFRONTIER
the multi-objective optimization and design environment

Key partner in Design Process Innovation

modeFRONTIER

the multi-objective optimization and design environment

modeFRONTIER is a multi-objective optimization and design environment, written to allow easy coupling to almost any computer aided engineering (CAE) tool,whether commercial or in-house.

As the name suggests, modeFRONTIER provides an environment which allows product engineers and designers to integrate their various CAE tools, such as CAD, Finite Element Structural Analysis and Computational Fluid Dynamics (CFD) software. Using a variety of state-of-the-art optimization techniques, ranging from gradient-based methods to genetic algorithms, the process or design of interest can be optimized by specifying objectives and defining variables which affect factors such as geometric shape and operating conditions. modeFRONTIER in effect becomes a wrapper around the CAE tool, performing the optimization by modifying the value assigned to the input variables, and monitoring the outputs.

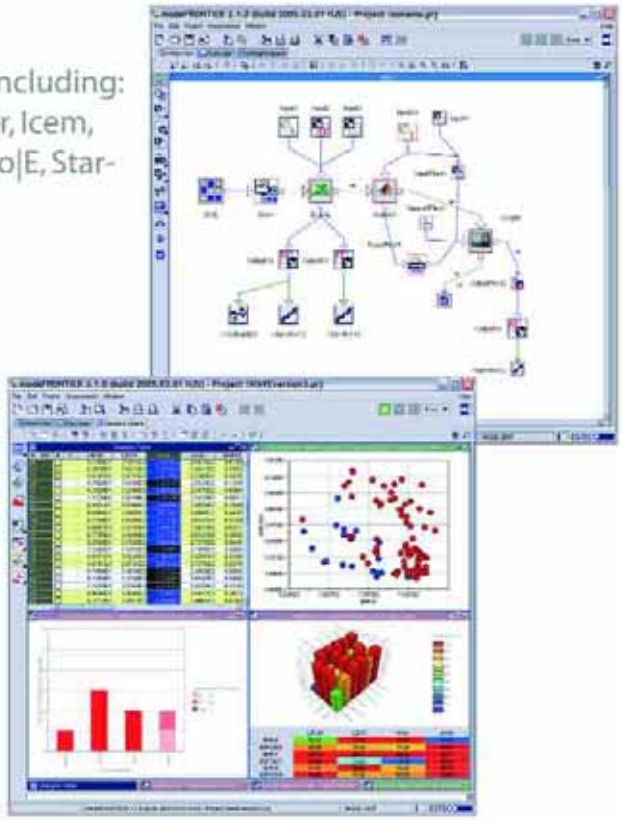
Process Integration

Running an analysis tool within the **modeFRONTIER** framework is extremely straightforward. There are no extra interfaces to license;

rather just one generic interface which can be used for virtually any CAE tool.
There are also direct interfaces for Excel, Matlab and Simulink; these programs can be used in their own right to perform an analysis, or to control another tool.
The same process integration techniques can be used to link different CAE applications; for example, **modeFRONTIER** has been used to perform a fluid-structure interaction analysis, where a CFD program and a non-linear FEM program were coupled. **modeFRONTIER** has been successfully run with a large number of commercial CAE and in-house tools, ranging from CAD software to FEM and CFD programs.

Coupled Software

modeFRONTIER has been successfully run with many CAE tools, including: Abaqus, Ansys, Adams, AVL-tools, CATIA*, CFX, Excel*, GT-Power, Icem, Kuli, LS-Dyna, Madymo, Magma, Marc, Matlab*, Nastran/Patran, Pro|E, Star-CD, Solidworks, Wave, Wamit
(* direct integration nodes)



Design Optimization

With **modeFRONTIER** only few steps are required for achieving your goals
- Describe the problem (parameterize)
- Set goals (objectives)
- Choose the optimization strategy

Using a wide set of DOE (Design of Experiment) and Optimization Algorithms, modeFrontier efficiently searches the design space for the optimum solution, or the Pareto Frontier (set of optimal design in a multi-objective problem)
Select the final design, with the help of modeFrontier's Decision Making tools

modeFRONTIER is a product developed by ESTECO srl - Italy
Find the reseller nearest to you at
www.esteco.com/product/resellers

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EnginSoft Flash

Ing. Stefano Odorizzi
General Manager EnginSoft

Every year, EnginSoft publishes a special English language edition of its Newsletter to inform the community of CAE and iDP technology users about the company and to provide updates on the international projects and activities in which it is involved.

As regards software technologies, the company's core activity is the promotion of mode FRONTIER, the avant-garde environment for PIDO (Process Integration and Multi-Objective Collaborative Design Optimization), produced by the associated ES.TEC.O., EnginSoft Optimization Technologies S.r.l.

The modeFRONTIER distribution network has grown rapidly and extensively, confirming the success of the product. The distributors that have been active for years, first among whom is CDAJ in Japan, have been joined by many new members. They together form a highly skilled team and a larger, stronger network. Above all, though, agreements have been made for integration and international distribution, as in the case of TNO-TASS, MAGMA (which has launched the converging product MAGMAfrontier), Moldflow, MathWorks, FTI and others. Furthermore, EnginSoft has opened branches or set up joint ventures. EnginSoft and ES.TEC.O. are thus present directly in the United States (ESTECO North America Inc.), in Scandinavia (ESTECO Nordic AB), in Germany (ESTECO GmbH), in France (ESTECO France S.a.s.), in the United Kingdom (ESTECO UK Ltd.) and in Spain (with APERIO Tecnologia en Ingegneria S.L.). In addition, an important partnership has been made with Dynardo GmbH whose OptiSlang software is the state of the art product in reliability analysis: The integration of the two companies' software technologies forms an unbeatable product worldwide. It should be emphasized that the distribution network that has been created is, above all, an extremely wide and multifaceted network of skills capable of providing effective customer support in the implementation of the PIDO approach to design and production processes.

But the year has not only seen EnginSoft committed to the promotion of modeFRONTIER. True to its mission of effectively supporting companies in the transformation of the design process, facilitating a rational transfer of technology, knowledge and methods, EnginSoft has further extended its activities in training, research and raising scientific awareness. The TCN Consortium of which EnginSoft is a member, achieved important new objectives in the field of training during the year. Managed by EnginSoft, these activities included the winning of new European Community funding for pilot projects in the Leonardo da Vinci programme, and for the extension of the European Atelier for Engineering and Computational Science in the Marie Curie programme. Other notable events during the year were the implementation on the Improve.it portal of courses developed within the METRO project (metallurgical training on-line) and of some lecture series from the von Karman Institute, the holding of an international 'mini-masters' course on 'Mechatronics: The practice of multidisciplinary system engineering', and participation in the organization of the Motor Vehicle Engineering masters course.

In the field of research, the year saw EnginSoft's debut as the coordinator of an IP (Integrated Project) financed by the European Community within the VI Framework. The project in question is NADIA (New automotive components designed for and manufactured by intelligent processes of light alloys), with a budget of over Euro 13 million. Again acting as coordinator, EnginSoft obtained funding for the further development of the newFRONTIER project. Other European projects that EnginSoft is taking part in are NEWAC (New aerospace engine core concepts), VERDI (Virtual engineering for robust manufacturing with design integration), the AUTOSIM network, the EuMat platform and the Joint Technology Initiative on Hydrogen and Fuel Cell.

The work involving the promotion of scientific and technological awareness has seen the company committed in numerous initiatives spanning the International Conference on CAE and Computational Technologies for Industry, to workshops on the applications of CAE to turbomachines and to the oil and gas sector as well as an active participation in various international conferences.

A brief account of all these activities is featured on the following pages. The intention is to give the reader an idea of what stands behind EnginSoft and the network within which it works, thus explaining why EnginSoft sees itself as industry's partner of choice in the design and production.

Stefano Odorizzi

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English Special Issue 2006

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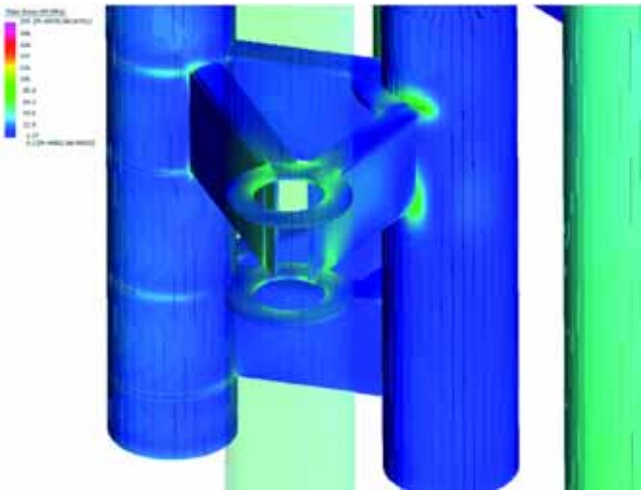
Structural Design of the Olympic Torch Turin 2006

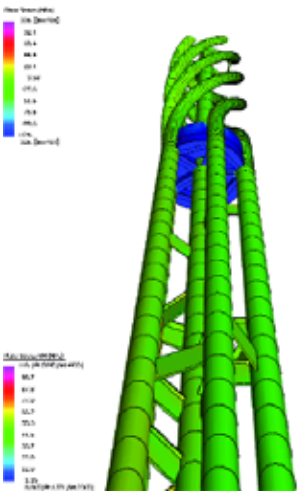
EnginSoft was awarded the contract for the structural design of the majestic torch for the Olympic flame.

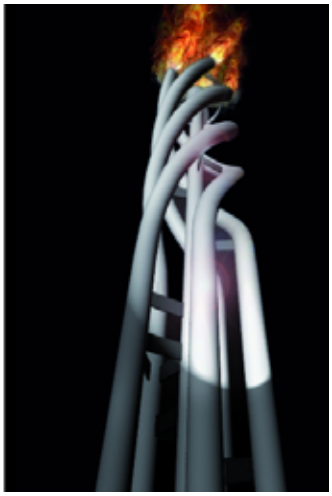
The wait for the winter Olympic and Paralympics games lasted four long years, but they were over in a flash, leaving the results obtained by all the athletes, as well as a storehouse of wonderful memories of splendid sporting achievements, the fruit of commitment to physical effort.
The Olympic flame not only illuminated Turin for months but has left behind the Olympic torch to recall the inseparable twin concepts of flame and peace, the fruit of a cultural heritage that has been handed down from ancient times to the present day so that the deepest meaning of sport be, or returns to be, centred on the highest moral values.

The 2006 version of the Olympic torch drew its inspiration from the creative idea of expressing the tension of the Olympic challenge in a single object: 5 flames for a single spirit, 5 as the Olympic rings, symbol of the union of the 5 continents. In iconographical terms the torch recalled the twisting of the athlete's body with his force bursting into a high, living flame and the effort that, in the end, is transformed into the objective achieved. With its 60 meters, the Turin 2006 Olympic torch won the record as the highest in Olympic history. The all-steel structure weighs 145 tonnes and is composed of three pre-fabricated, site-assembled segments of 32, 17 and 11 metres in length, the latter forming the twisting summit. Given its height, the flame could be seen by the whole city of Turin as it burnt in the torch composed of 5 tubular columns, each 60 cm in diameter and set on the points of a pentagon described in a circumference of 3 metres. A sixth 60 cm diameter tube starts from the base of the structure and is connected to the external columns by spokes arranged in a spiral to recall the twisting effect mentioned above. This tube reaches the top of the structure where it widens out in its last three metres to house the burners needed to launch the Olympic flame 4 meters into the sky. At the top of the torch, the 5 external tubes, in their turn, take on the twisting movement.



With very tight deadlines to work to, the Turin Olympic Committee entrusted the fabrication of the torch, designed by Pininfarina, to Costruzioni Cimolai Armando Spa (CCA) the company that had worked with the architect Santiago Calatrava on the restyling of the Olympic Stadium in Athens. As had in part happened on that occasion, CCA turned to EnginSoft for the structural design, dimensioning and construction details of the Turin 2006 torch. EnginSoft' s role was to develop the structural modelling of the inside of the torch, analysing its behaviour under various design loads in order to optimize the dimensions of the welding with the reduction of fabrication time to a minimum while respecting the maximum safety parameters that the structure had to respect.





The design and fabrication of the Olympic torch provided a further occasion to demonstrate that EnginSoft' s technical specialists were, and are, able to deal with such projects from the design stage to the structural modelling and its validation against relevant standards, and the production of the required technical documentation and support data for the engineering decisions taken. The close cooperation between CCA and EnginSoft, together with their high-level skills, enabled CCA to successfully meet the delivery date for the torch and thus pave the way for the original and spectacular inauguration ceremony for the 2006 Turin Winter Olympics.

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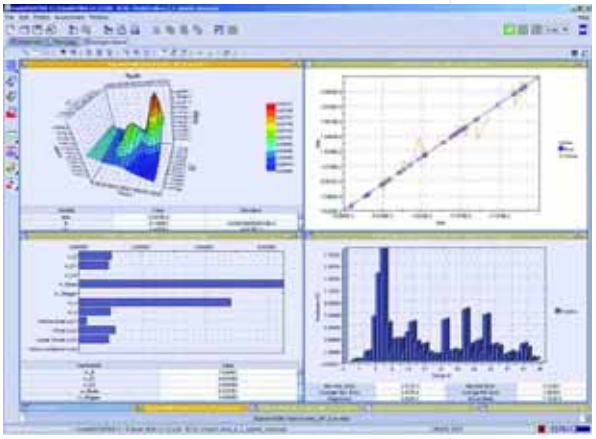
Case Studies

Optimization Applied to Mechatronics

Mechatronics

The term mechatronics comes from the two words mechanics and electronics, with the latter having the meaning that is embraced in today's concept of information engineering: electronics, automation, computer science and telecommunications.

A large number of machines and processes are electromechanic in nature, having electronic controls. Some examples are found in the automobile, aerospace and manufacturing industries, consumer products (household appliances and video recorders, for example), machine tools and robots. The ever greater use of applied electronics and electromechanical processes, and in particular the use of programmable electronic systems with microcontrollers, has lead to a new approach to the design of these processes that can be defined as an integrated process. The philosophy at the base of mechatronics is the integration into a single project of the three competences that were traditionally and distinctively those of electronic, electrical and mechanical engineering.



A machatronic project is thus essentially the integration into a mechanical project of the modern technologies of sensors, actuators, and movements controlled in real time by programmable devices such as microprocessors, DSP, PLC etc. This integration is, moreover, only possible if the mechanical project is managed using modern techniques able to calculate movements and stresses, foresee noise and vibrations, calculate laws of motion and torque for input to the electronic systems as references for the correct operation of the system. The mechanical approach to the project results, for example, in the substitution of some mechanical functions by electronic ones which are more flexible and sometimes less expensive and more reliable. The results are higher performance products which are easily reconfigured using software and thus more flexible for the user and able to keep pace with markets that are ever more demanding in terms of price and performance.

Why modeFRONTIER applied to Mechatronics in the Design of Dynamic Systems

Good design in mechatronics involves a very wide range of skills, while the fields of application span mechanical and electrical engineering, thermodynamics, hydraulics, pneumatics, heat transfer and control systems. This implies an all but common broad understanding and vision, and above all the difficult interpretation of optimization using DOE. This is precisely the field of application for modeFRONTIER, namely the integration of an optimization system with one for a decision support, and basically when the design team has to work with a multitude of knowledge sectors. modeFRONTIER differs from other optimization systems also in that in addition to providing full support and algorithm base for DOE and multi-objective optimization, it internally integrates tools to judge and weigh the possible solutions obtained that meet the needs of the team as a whole.

Let us take an example of a project in which it is necessary to optimize both the mechanical component as well as the associated control and pneumatic systems. Any optimizer can find a range of solutions in a given time, but the final decision then has to obtain the optimum that satisfies all the disciplines involved, without upsetting anyone, and perhaps not reviewing the improvements possible with small variations to the set parameters.

The integration of monodimensional codes or block systems is very strong in modeFRONTIER and this enables the rapid construction of multidisciplinary optimization models with an equally fast solution that permits the team to concentrate on the important decisional phase of the project.

Thematics Deepenings

New partnership with DYNARDO

DYNARDO GmbH, EnginSoft S.p.A. and ES.TEC.O. srl have announced a new partnership.

This strategic move by global leaders in the field of engineering simulation, reliability analysis and optimization will result in the marriage of key technologies for fast and better virtual development of industrial products through systematic simulation. By coupling the sophisticated optimization analysis techniques in ES.TEC.O.'s flagship product, modeFRONTIER and the most advanced reliability analysis techniques of DYNARDO's OptiSLang an outstanding

software platform for CAE-based virtual product development is born. The relationship aims to further improve the methodology and to offer customers the best software available on the market for the ongoing evolution in virtual prototyping.

Carlo Poloni, President, ES.TEC.O, says: "The technical cooperation with Dynardo will bring sophisticated and efficient reliability analysis tools available in OptiSLang into the modeFRONTIER environment enhancing the wide applicability of our software tool". Johannes Will, CEO, DYNARDO: "Thanks to the extensive integration capabilities of modeFRONTIER, OptiSLang users will have the opportunity to apply the experience gained so far in vertical applications to a much wider application area and possibly influence the entire life-cycle of industrial products."

Stefano Odorizzi, CEO, EnginSoft, says: "We will bring into the cooperation 20 years of experience in the CAE arena supplying all the experience needed to apply at best and in cost-effective manner the software technologies developed by ES.TEC.O. and DYNARDO".

The agreement between ES.TEC.O. and DYNARDO involves the development of software interfaces that will give access to the best technologies owned by the two companies to the global industrial community of designers.

About DYNARDO

DYNARDO was founded in 2001 as a software development and consulting company to transfer leading scientific know how in CAE-based reliability analysis into practical applications. SLang, the leading scientific software for reliability analysis is used by DYNARDO as base for software developments as well as for consulting services. Since OptiSLang was introduced in 2002 into the German market the software has been successfully established as integral part of the virtual product development process of DYNARDO customers. With a strong and mature background in structural dynamics as well as in CAE-based optimization and reliability analysis, DYNARDO is offering today software and services for various engineering fields like mechanical, civil, power generation or automotive engineering.

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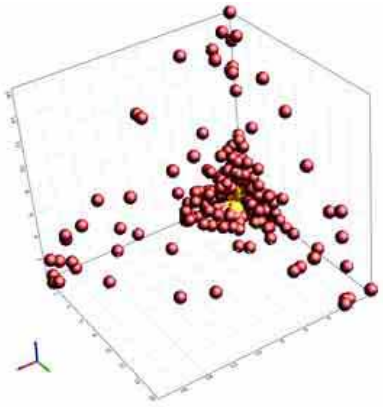


Research: at the Heart of Innovation

EnginSoft views research as the means for the transfer of technology to industry

EnginSoft has always regarded knowledge as being indispensable for innovation for it is knowledge that consistently feeds research at all levels.

The company's Memorandum and Articles of Association make explicit reference to this vision, as does its mission statement which is more closely defined in terms of its characteristics, objectives and methods in the dossier with which the Italian Ministry for Universities and Scientific and Technological Research recognizes EnginSoft as an official laboratory for the transfer of technology to industry in the CAE and iDP sectors (Official Gazette 298, 22/12/1994). This is not pure, but applied and industrial research to bridge pure research, which redesigns the criteria with which scientific knowledge is produced, to the needs of industry.
This type of research is therefore subject to cost evaluation and is designed and evaluated in terms of its return on investment in the short to medium term. The discoveries of the possible indicated by pure research have to be consolidated and made feasible in industrial know-how. It is not enough to discover new lands: roads and bridges have to be built if they are to be reached and inhabited.

The work EnginSoft has done and the experience it has gained have recently won the company recognition of its critical mass sufficient to coordinate one of the biggest Integrated Projects (IP) financed by the European Community, namely the NADIA project (New Automotive components Designed for and manufactured by Intelligent processing of light Alloys, contract no. 026563-2). EnginSoft presented the proposal in the context of the call of the 6th EU Research Framework Programme, under Priority 3 (Nanotechnologies and nanosciences, knowledge based multifunctional materials, new production processes and devices: NMP), in the field of "Simultaneous engineering and production of integrated high-tech components for European transport". This is the most important (and most recent) of EnginSoft's achievements, to be numbered along with many other initiatives promoted by the company. There follows a description of the major current projects.

The NADIA project

The NADIA project (www.nadiaproject.org) aims at improving the competitiveness of 12 EU SMEs engaged in simultaneous engineering and the production of novel high technology transport components to exploit the potential of light multifunctional alloys for automotive components.

The project kicked-off at the beginning of May this year at a meeting attended by over 50 representatives of the 24 consortium members that, at the same time, form:

- a vertical supply chain for knowledge development (one secondary Al producer, two foundries, one casting equipment producer, two software developers, three design & engineering companies, two special materials and treatments companies and one engine producer and assembler); and with
- one producer of primary Al and Mg alloys (Hydro), at the start of the chain, and two car manufacturers (DaimlerChrysler, Ford) at its end;
- a tier of horizontal research groups (four research centres and four universities).

List of Nadia Partners:

EnginSoft SpA, Italy; Centro Ricerche Fiat, Italy; DaimlerChrysler, Germany; Hydro Aluminium, Norway; Raffineria Metalli Capra, Italy; Teksid Aluminum, Italy; ASMET, Poland; ABAMOTOR Energia, Spain; Magma GmbH, Germany; Foundrysoft, Sweden; University of Trondheim, Norway; University of Padova, Italy; Inst. Podstawowych Problemów Techniki, Poland; Helsinki University of Technology, Finland; SINTEF, Norway; Fundacion Tekniker, Spain ; MBN, Italy; MATFEM, Germany; Thermico, Germany; LPM, Italy; IMPERIA, Germany; Tenhults Pressgjuteri AB, Sweden; FORD, Germany; University of Jönköping, Sweden.

NADIA addresses multi-level S&T objectives, including:

- Engineering & Production (proof-of-concept light alloy multifunctional components for the transport industry).
- Applied RTD (multi-scale design and simultaneous engineering tools; processing solutions; procedure and standards for components).
- Basic Research (models of nano-scale phenomena in alloys and nano/micro structure effects on properties; alloying element effects on components behaviour; optimized nano-size powders for coatings)

NADIA is an integrated project:

- Vertically by covering the entire value-chain;
- Horizontally by having an intrinsic S&T multidisciplinary nature;
- Activities that interact with each other and with demonstration, education, and dissemination;
- Partnership by highly complementary partners;

- European by competitiveness of the networked enterprises strengthened at a European level;
- Financially by mobilising public and private sector funding schemes.

Such integration allows for the combination of materials, processes and new Nano-Micro-Macro (NM2) simultaneous engineering tools to be used in the production of automotive transport demonstrators. Appropriate training activities support the correct use of the alloys, processes and engineering tools being developed within and beyond the project, to develop the professional skills of the professionals involved.

The total cost of the project exceeds Euro 13 million, with an EU contribution of over Euro 7 million: completion is foreseen within four years.

The NEWAC project

The NEWAC project (New Aerospace Engine Core Concepts) is an Integrated Project within the 6th EU Research Framework Programme (www.newac.org), with the objective of radically innovating turbojet components. It is one of the largest EU funded projects, with a consortium of 40 partners drawn from industry, research centres and universities committed to a 4 to 5 year research programme costing some Euro 75 million.

The WorkPackages into which the project is divided are directed by the leading European engine companies: MTU, Snecma, Rolls Royce and Avio. The partners include other industry leaders including Turbomeca, Volvo Aereo and Airbus.

The objective of the project is innovation directed at the reduction, in its various aspects, of fuel consumption and emissions in line with the standards set for the new generation of engines that will be installed in Airbus aircrafts from 2020. In particular, the project will study new cycle concepts for the compression phase and new systems for the combustion phase.

EnginSoft will participate in the combustion WorkGroup along with Rolls-Royce Deutschland, Turbomeca, Avio, Onera, DLR, Cepr and the universities of Florence, Karlsruhe and Graz thanks to its experience gained from the CLEAN project on combustion in aero engines. The unique, and particularly favorable position for EnginSoft derives, on one hand, from the company's know-how in CFD combustion processes and, on the other, its proprietary software for the optimization of the design and production process, both giving it a central role in the development of virtual design of a new burner initiating innovative concepts for injectors. The project will be developed by designing a virtual model of combustion with a parametric structure that will be optimized, in line with the guide lines, objectives and the constraints set by the partners.

The first milestone has been fixed for December 2007. In the case of success, the development of the first prototype will follow, with its testbed evaluation. The project kicked off in June of this year.

The VERDI project

The VERDI project (Virtual Engineering for Robust Manufacturing with Design Integration) is a STREP within the 6th EU Research Framework Programme (www.verdi-fp6.org). In addition to EnginSoft, the VERDI consortium numbers six major aero engine and component manufacturers, together with six universities and three research institutes, that have pooled their expertise and resources to reach beyond the current state-of-the-art in manufacturing process simulation.

The aim of VERDI is to contribute to winning global leadership for European aeronautics by developing a new generation of engineering technologies that allows for the complete virtual manufacturing of structural aero engine components to be integrated with the design process and manufacturing. This technology enables the combined effect of all manufacturing processes to be taken into account already during design so that robust manufacturing methods are designed into the component. This will minimize the cost and lead time due to physical trials and long feed back times from manufacturing to design. The technology to be developed will trigger a quantum step in cost reduction for design or re-design of new or existing aero engine components. By integrating design, product development and manufacturing using virtual tools component cost and time-to-market will be reduced by 25%, increasing market shares and competitive business performance. The vision is complete virtual manufacturing of the component, predicting its deformation and residual material state after manufacturing and using these results in life and strength analysis of the component. This shortens the cycle time between experimental observations and design changes during product development.

Contractually, EnginSoft's role in the project is limited to the simulation of some machining processes to be undertaken both with simplified and summary approaches and with detail models. Right from the kick off, however, it has been clearly logical to redefine this role given the possibilities offered by modeFRONTIER as the environment in which to manage the logic of the whole process from the point of view of its overall optimization. The project started in September of last year, has a budget of Euro 6 million and a life of three years.

Other European Community projects and activities

The research projects described above are the three main activities funded by the European Community in which EnginSoft is involved, but there are also others that merit mention. Among these there is the ***IDEAL project***

(Integrated Development Routes for Optimized Cast Aluminium Components), financed by the European Community within the 5th Framework (www.idealproject.org) and intended to create an integrated suite of software tools for the design and

production of more reliable, efficient and optimized cast aluminium components. The project is now in its closing stages and can be seen as opening door to the NADIA project.

The ***AUTOSIM*** project deserves to be mentioned (www.autosim.org) with its basic objective of promoting better and more effective use of simulation technology in the European Automotive industry. It has two complementary aims: firstly to develop best practices and secondly to identify the most promising potential future breakthrough technologies. These aims and objectives will be examined under three primary themes namely integration of simulation into the development process, materials characterization and improving confidence in the use of simulation.

In order to address these issues, Autosim has established an international team of leading experts representing much of the European automotive industry (32 companies from throughout Europe). They will develop a preliminary set of best practice guidelines, standard analytical procedures and research strategies. They will then consult with the wider automotive industry to gain feedback on these preliminary documents, in order to produce final documents which aim to provide definitive guidelines from an authoritative and credible source. These final versions will be made available internationally throughout the automotive industry. Their adoption will increase the efficiency and improve the quality of simulation, increase the efficiency of the supply chain, enable simulation to be practiced more effectively by a broad range of personnel, coordinate ongoing research by providing a focused set of priorities, and assist industry to plan its future implementation strategy for simulation.

EnginSoft is also taking part directly in Technology Platforms including ***EuMaT*** (European Technology Platform for Advanced Engineering Materials and Technologies, www.eumat.org), launched to assure optimal involvement of industry and other important stakeholders in the process of establishing R&D priorities in the area of advanced engineering materials and technologies and ***HFP*** (European Hydrogen and Fuel Cell Technology Platform, www.hfpeurope.org), which aims at fulfilling the European energy policy's objectives of reduced greenhouse gas emissions and improved security of supply by making hydrogen and fuel cells a market reality. As regards the latter Platform, EnginSoft is one of the signatories to the Joint Technology Initiative, in which Italy is participating as a leading player.

Last, but certainly not least, EnginSoft is a member of a number of networks, including ***APSN*** (Advanced Passive Safety Network, www.passivesafety.com), which has been established to promote passive safety research and, equally importantly, to help in the dissemination of information and results, all with a view to reducing the number of casualties on European roads.

Projects and research activities financed by Italian agencies

EnginSoft is also very active in Italy at two levels, firstly by taking part in funded research projects and secondly by effectively offering services to companies to identify the most suitable financial tools to support their innovation initiatives through research. There are, in effect, many financial instruments offered in Italy by central government, the regions and other public bodies, but they have differing objectives, regulation and funding mechanisms and these factors often act as disincentives. If it is true that in Italy there is very little money destined for research, it is equally true that the demand for the funding of applied and industrial research is very limited. This is the background that has led to the service offered by EnginSoft, which can boast many success stories since its introduction in 1994.

The projects in which EnginSoft is currently participating directly include:

The ***QL-REDOUT*** project, financed by the Autonomous Province of Trento, for the development of displacement transduction and signal amplification systems able to operate in the audio frequency range with sensitivity near the quantum limit, and which has already produced some very interesting results (see, for example: M.Bonaldi, M.Cerdonio, "Principles of wide bandwidth acoustic detectors and the single mass DUAL detector", to be published on Physical Review).

The ***newFRONTIER*** project, financed by the Autonomous Province of Trento and coordinated by EnginSoft, and intended to extend the functionality of modeFRONTIER in the three aspects that characterize the system: the integration process, MDO (multi-objective optimization), and documentation and decision support. Other partners include Dynardo GmbH and InuTecH Gmbh, companies with whom EnginSoft has worked in the past with particular regard to reliability analysis and robust design, cooperation that could be developed further to the full advantage of technologies involved. Another important contribution to the project is to be made by the Department of Computer Science, Systems and Communication of the University of Milan, with particular regard to knowledge management and, more specifically, to the modelling of core knowledge and practices in the company environment.

The ***PITIS*** project (Integrated design with safety engineering and

computational fluid dynamics), financed by the Apulia Region (Official Gazette No. 49, April 2006), is intended for a consortium of that includes, in addition EnginSoft, the University of Lecce and Stim Engineering. The project regards the creating of a software environment suited to the needs of both designers and public bodies in dealing with fire fighting in buildings. The project has an interdisciplinary approach and provides for the implementation both of methods derived directly from the usual design formulation and the application of advanced CFD correlated to the various standard to be observed.

The ***SIPAR*** project (Integrated strategies for the recycling of urban waste water in Apulia) financed by the Apulia Region and started in April 2006 with coordination of the University of Taranto, features EnginSoft for the CFD simulation and multi objective optimization as support tools for the design of the water treatment plants.

The ***FIRS*** Hydrogen Production research project (Integrated systems of hydrogen production and their employment for distributed generation) funded by the Italian Ministry for Research, aims to integrate innovative systems of hydrogen production with plants of thermoelectric power generation fed by biomass and/or fossil fuel for waste recovery. The project intends to research the production of hydrogen, its purification and integration as a fuel in the power generation plant. As far as the combustion of hydrogen itself goes, innovative low environmental impact combustion systems will be investigated, together with the evaluation of their economic impact.

A major player in the project is ENEL, the Italian electricity generating company, while its coordination is the responsibility of the Consorzio Pisa Ricerche research institute. Another partner is Riello, one of the biggest companies in domestic boilers and burners, which is active in the development of innovative technologies for applications applied to residential micro-power-generation. Domestic residential micro-power-generation is seen as a strategic new future market by several companies in this sector. The role of EnginSoft regards the CFD simulation of combustion in catalytic reactors guided by an optimizer, so that a flexible expert system of the process can be developed and later employed in the several scenarios that different power plants will require. Among the industrial projects seeking funding for which EnginSoft has acted as a service provider in its role of an official laboratory for technology transfer, the ***INNOFRIDGE*** project promoted by Whirlpool is emblematic.

The objective of the project is the identification of innovative solutions for the production and assembly of refrigerators and freezers in order to reduce costs and production time while increasing quality and the functions available to the end user. A fundamental aspect of the project is the development and testing of the design method and, in particular, how to operate in a collaborative environment at the concept generation level in new products. There is the conviction that such a methodology can be replicated and it is for this that EnginSoft was invited to participate with the PIDO technologies it can make available.

Research, at the heart of innovation

The fact that innovation is always a competitive advantage for companies is clear to everyone. Accelerating technological development allows almost no one to remain static with the same product and process technologies. The question for companies is how to draw on the pool of knowledge that develops over time from the workings of science and research so as to be able to start a useful and coherent process of innovation. EnginSoft can intervene at various levels, but above all in process innovation, that is to say the optimization of the tools and knowledge useful for the production of a good or service. On occasions, and in the strict sense of the term, EnginSoft's contribution can be said to be to the architectural innovation of the process, that is to the optimization of known technologies in innovatively synergetic combinations. This allows companies to fully enjoy the advantages of high-tech, without necessarily having to undertake pure research. The projects cited above give ample testimony of these opportunities.

For more information:
info@enginsoft.it

EnginSoft promotes PIDO technology through TechNet Alliance

EnginSoft will have an important role in Technology Network Alliance AG to promote PIDO technology

What is TechNet Alliance

The TechNet Alliance is a unique consortium in the Computer Aided Engineering (CAE) industry. It is comprised of the world's largest network of engineering solution providers dedicated to the application, development, training, support and marketing of CAE best-of-class software.

In addition to CAE service companies, business support companies and renowned professionals from industry, professors from universities and even representatives of corporate companies also belong to this network.

TechNet Alliance is a membership organization that holds formal meetings twice per year. Activities of the organization are managed by the Technology Network Alliance AG, a company registered in Switzerland. Membership is by invitation only.
The global alliance comprises more than 800 CAE experts in 40 companies, 18 countries, 110 locations communicating in 15 languages.

The mission of TechNet Alliance is to offer CAE services including best-of-class software, training courses, consulting and customization through an international network of independent member companies, which is based on trust and respect.

Why Alliance

Despite its wide range of application, CAE is a niche market. For example, it is estimated (2004) that each year about 15 billion US$ are spent on PLM software and services. The estimated share of purchased CAE tools worldwide including services is 2.3 billion (This does not include the CAD, CAM, or PDM markets). It is assumed that the net value (total usage) is 5-6 times of the above numbers.

Because CAE is a complex and fast developing technology, it requires expertise in a variety of disciplines. Service companies who can provide this expertise are typically small to medium size enterprises focused on one specific industry or discipline.
No single company exists that can possibly possess all of the world's CAE knowledge and experience. Therefore, it is difficult for a large company to find sufficient CAE expertise to satisfy its needs. However, by combining the best engineering talent, product knowledge, consulting expertise, training and support into a single entity, an "Alliance of Experts" can collaborate to solve the most complex CAE-problems.

Such an Alliance may function as a "virtual corporation" providing a high concentration of CAE expertise and services worldwide not available through any individual company.

In the future, networking and building alliances becomes vitally important to remain competitive in the global market. This is especially true for small and medium sized companies.

TechNetAlliance
Technology Network Alliance AG

For these reasons a company, Technology Network Alliance AG, was established 1998 in Switzerland by an international group of CAE service companies ("Founding Members"). By combining the unique expertise of many companies into a "global corporation", the Alliance is capable of focusing the skills, resources, and people to fulfill a market need.

Today the TechNet Alliance is perhaps the world's largest network of engineering solution providers dedicated to the application, development, marketing and support of CAE software. Beyond CAE service companies, business support companies, renowned professionals from industry, professors from universities and even representatives of corporate companies also belong to this network.

Dispatches

EnginSoft has always believed in TechNet Alliance and has been a member since 1999

Networking among companies working in the same sector is often an ideal solution in today's global market, and it is all the more so when dealing with avant-garde technologies. However, it is not a simple matter for those working in the field of virtual prototyping to network in a stable and effective way because the organizations involved are almost always very small and, since the product is mainly knowledge it is difficult in practical terms to establish the complementary nature of the cooperation or interact without upsetting the sensibilities of one or other of the partners involved. TechNet Alliance is a notable exception whose success can be a matter of pride for its members: it is an authentic international community of experts in CAE and associated technologies offering the market highly specialized skills in various industrial sectors.

What is TechNet Alliance's secret? The company is based on reciprocal trust and the recognition of, and respect for the competences of each member: compliance with these basic values is monitored by TechNet Alliance's founders, players who have written the history of CAE services in their respective countries. Evidence of this are the specific contributions that EnginSoft has made to the alliance regarding metallurgy and process simulation applications, the integration of process and MDO, decision support tools and, on an organizational level, experience of industrial research and public funding, and in training. To this is added a touch of Italian style that, on its own, is an element that helps bind the group together.

For more information:
www.CAEworld.com

EnginSoft CAE Users' Meeting 2006

CAE Technologies in industry - 9-10 November 2006 Stezzano (BG)

EnginSoft, industry's partner for the innovation of the design process, announces the CAE Technologies in Industry Conference to be held on 9 and 10 November, 2006.
The conference will take the form of sessions divided by industrial sector within which the tangible returns demonstrated with the use of CAE in companies will be examined through numerous example applications.

The decision to innovate the production process means exploiting the impact that the chosen technologies and methods have on the design process, both in terms of productivity and reliability, evaluating the present and future validity of the investment, the interactions with the associated design and production functions, and the compatibility with the company's management systems.
All this, evidently, has to meet the objective of competitiveness.
EnginSoft wishes to show that CAE is an indispensable element in this context.

Conference themes include:
applications to computational mechanics, dynamics and in general to models for materials; computational fluid dynamics and fluid-structure interactions; process integration, multidisciplinary optimization and decision support tools; simulation of industrial processes.
A significant part of the conference will be dedicated to the illustration of the new releases and functions of all the virtual prototyping software distributed by EnginSoft:
modeFRONTIER, ANSYS, ANSYS CFX, MAGMAsoft, FTI, FORGE, AdvantEdge, and others.

For more information:
http://meeting2006.enginsoft.it
eventi@enginsoft.it

EnginSoft's Mission: Education

The transfer of scientific and technological knowledge necessarily demands an open minded company culture

The transfer of scientific and technological knowledge is of extreme importance to society as a whole as well as to technological innovation. The process is on-going and cannot be managed through institutional training programmes.

In the field of digital prototyping and its associated disciplines, this process is particularly critical. Firstly, because in this sector changes and improvements are made with great rapidity. Secondly and more specifically, theory and practice must be integrated in the training for these technologies to ensure it will be successful and to maximize its usefulness in the design and production processes. If on the one hand it is not enough to have a simple technical command of the tools to be employed effectively, and for this to be accompanied by an understanding of the methodology and an overall vision of the design and production process, on the other this understanding is of no use to anyone if it lacks an application.

TCN
Tecnologie per il calcolo numerico
:: Centro Superiore di Formazione

EnginSoft is convinced of this and has made training a fundamental part of its mission in offering a series of tools that contribute to an educational structure and programme that is almost without precedent in the sector. The activity is not limited to the provision of training courses (there are over 40 in the catalogue) as this would not be going very far as it would make only a partial contribution to targeted training, but it forms a system that includes the organization of workshops, seminars and conferences, the delivery of short, specialist courses of which there are over 120 in the catalogue, and 'mini-masters' courses. The activity continues with the conduct of international events funded by the European Community, participation on sector committees and the provision of specialized masters courses, the management of post graduate and ad hoc scholarships, and the creation and support of a distance learning portal.

The work associated with these activities is undertaken in part by EnginSoft, and more widely and systematically by the TCN consortium (www.consorziotcn.it) of which EnginSoft is a founder member and currently managing partner.

Detailed information on the training courses can be found on the organizations' sites or on request directly from the organizers' offices.

Other training activities in which EnginSoft is involved are briefly outlined below.

EU funded training projects

EnginSoft, either in first person or working through TCN, has always taken part in training activities funded by the European Union, mostly within the Leonardo da Vinci and Marie Curie programmes.

The company is currently involved in the following Leonardo da Vinci projects:

METRO (Metallurgical Training On Line - www.improve.it/metro: see also EnginSoft Newsletter, 2, 34, 2006). The main objective of METRO is the setting-up of a comprehensive curriculum of on-line training courses on metallurgy. The courses form an unmatched single system in terms of the timeliness and comprehensive nature in which the subjects are dealt with by the training specialists, the format in which they are delivered and the consistency of the structure and navigation system, all of which ensures the flexibility and immediacy that industry needs.

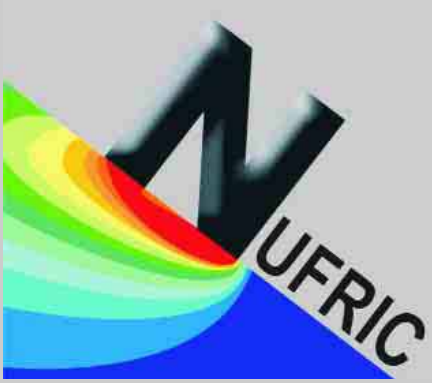
ESoCAET (European School of Computer Aided Engineering Technology - www.esocaet.com): see also EnginSoft Newsletter English special Issue 2005). ESoCAET promotes new, highly qualified part-time masters courses to consolidate CAE application-orientated expert knowledge at a higher scientific level with consideration of management aspects. Practical aspects, theory and competence in scientific methods constitute a good mixture for qualification for higher career positions.

ESoCAET
European School of CAE Technology

NUFRIC (Numerical Based Medium Level Training on Industrial Friction Problems - www.nufric.org). This project intends to give an example of how to change the style of technical vocational training by bypassing the traditional syllabus of technical courses. The subjects covered are the contact-friction-wear problems of mechanical parts, issues of considerable technical and financial interest and therefore with potential impact on employability.

ILTOF (Innovative Learning in Fracture Mechanics). This project, which has only recently received EU funding, concerns fracture

Training



mechanics and, more generally, the evaluation of structural integrity. The theme is of great current interest in professional practice and requires the completion of two particularly critical phases, namely the transfer of scientific knowledge and the transfer of technological understanding. This process needs to produce the necessary communication between pure, applied and industrial research, providing the appropriate language for such transfers, and this is the objective of the project in question.

Within the Marie Curie programme, the project that is currently underway is **EUA4X** (European Atelier for Engineering and Computational Sciences - www.eua4x.org: see also EnginSoft Newsletter 1, 30, 2006). EUA4X offers a Europe-wide training environment for the carrier development of young researchers through a coherent program of conferences, training courses, lecture series and workshops, as well as virtual events in the area of applied scientific computing and its applications to a wide number of problems that are currently at the forefront of research. The project offers some 500 fellowships to attend the events. The project, now at its half way mark, has enjoyed a much greater success than had been expected, and in particular in terms of the numbers attending the events which has been well in excess of the indicators set by the EU. For this among other reasons the project will probably be refinanced beyond 2007. The project coordinator is TCN. Part of the events are also available on the Improve.it portal.

Conferences, seminars and workshops

Conferences, seminars and workshops are ideal events for the creation and maintenance of the climate needed to understand and adopt new technologies and again in this field of activity EnginSoft has matured enviable experience. In addition to its own annual conference (http://meeting2006.enginsoft.it), the annual TCN-CAE International Conference on CAE and Computational Technologies for Industry, held by TCN (http://tcncae2005.consorziotcn.it), and its participation in similar events organized by its TechNet Alliance partners (www.caeworld.com, http://www.figes.com.tr/conference/tr/2006/ ,www.icatconf.org, www.usersmeeting .com), there are many other initiatives that merit mention.

Among these was the conference on "Mechanatronics, the integration of technologies to win the challenges of the future" (http://www.enginsoft.it/ meccatronica06), organized together with Brembo, that, with the coordination of Prof. Francesco Jovane, leader of the European Manufuture Platform, and following the welcome speech given by Alberto Bombassei, Deputy Chairman of Confindustria, the Italian employers' association, provided an overview of the subject in the automobile, aerospace, biomechanical and industrial automation sectors. There followed a particularly lively round table discussion coordinated by Luca De Biase, from the financial newspaper 'Il sole 24 ore'. A similar event was launched by Indesit Company, who chose EnginSoft to organize a CAE workshop in which the company's managers who had played key roles in the introduction of numeric simulation in product development processes discussed its advantages and the opportunities it afforded. The contributions made by the technical directors of companies including Immergas, Teuco, Tesco, Ducati Motor and Sit la Precisa, gave a clear outline to the subject and, above all, with great realism indicated the changes that are necessary for the CAE tools to become truly design instruments in the development of product and process. The parallel exhibition featured exhibitors including Altair, Aurora, IBM, LMS, Moldflow, MSC, UGS and Meccanica Generale, among others.

Many other similar workshops have been held with, for example, Piaggio in the motorcycle sector, Saipem in the chemical, oil and gas sectors, and a number of universities.

EnginSoft has made important contributions to conferences organized by third parties, including Metef 2006 (www.metef.com), at which the company sponsored two important conferences with the support of the Italian Association of Metallurgy and entitled "Foundry, Strategies for Competitively. Success Stories" and "Forum on Diecast Technologies: the Automatic Production 'Island'."
In similar vein, EnginSoft has taken part at TurboExpo 2006 in Barcelona, Plast 2006, Tool 2006 (www.tool06.org) and other, smaller events.

Distance learning

EnginSoft has created and maintained its own e.learning portal for a number of years (www.improve.it). The portal is the industrial application of a prototype developed seven years ago as part of the European MOPLE project (Modular open-platform and tools for personalized learning in computational engineering methods - EC contract IST-

1999-13460). In general, e.learning represents a notable opportunity, all the more so in contexts in which ongoing training and education is indispensable, as is the case with CAE technologies that are in continuous, rapid evolution. In such cases the use of distance learning means maximising flexibility and efficiency in knowledge transfer as it offers 24h access, one to one teaching on specific subjects of immediate interest, updated teaching materials, personalized training programmes, zero cost in terms of lost travelling time, direct lines of communication with the lectures and trainers, potential for blended training, minimized loss and duplication of effort and immediate, facilitated orientation.

Improve.it has shown itself more than able to cope. The portal mainly offers courses in the three sectors of CAE, materials engineering and production processes, and civil engineering. There are over 700 teaching modules for some 60 courses with at least 40 percent of the teaching materials reviewed each year. The greater part of the teaching materials are original and in part come from the pilot projects described above.

Other activities

EnginSoft undertakes other training activities as well as meeting demands from industry by organising ad hoc training solutions. An example that deserves mention is the so called 'mini-masters', which takes the form of periods of intensive training based on the summer school concept or lecture series, and characterized by the sharing, full time, of experiences between the lecturers who come from both industry and academia, and the students. All the mini-masters organized by EnginSoft are international in nature. Among those that have enjoyed the greatest success are the mini-masters in CFD, and that on "Mechatronics: the practice of multidisciplinary system engineering", which is particularly appreciated by the automobile industry and is held twice a year. Another international mini-masters is on CDF, with in this case a particular structure that features a first week that is common to all participants and a second week offering three different specialisations: turbulence, multphase flows and combustion. The participants are thus offered the maximum of flexibility. Other mini-masters cover knowledge management, numerical acoustics, MDO, and fatigue and durability. EnginSoft, with TCN, has also organized an intensive masters in CFD, and set up an agreement with universities for the holding of a masters in process simulation.

EnginSoft's Training Department Registered Logo

Lastly, EnginSoft together with TCN, is the only non-university structure in the engineering sector to be part of the Univirtual Foundation (www.univirtual.it) which was launched by the universities in the north east of Italy to define the standards for distance learning and to organize the main corresponding activities.

An unmatched menu

As a whole the training menu offered by EnginSoft is unmatched in its sector. Complete and flexible, it adapts well to meet the needs of industry and is completely in line with the European declaration made at the Congress of Lisbon: "Europe should become, by 2010, the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion".

Training

Distance engineering with DENGI

http://dengi.enginsoft.it: a new company service from EnginSoft

Dengi is a portal that allows companies access to high-level engineering applications via a standard internet browser.
Companies often find that they have to limit the use of TCO applications because of:

- expensive user licences;
- installations that require changes to the existing hardware and software configurations;
- steep learning curves.

Dengi avoids all these obstacles. All that is needed is a standard PC, an internet connection and a normal browser: EnginSoft looks after the rest! You input the data, and we see to the computations on our dedicated servers. After connecting to the portal and having chosen the application that best meets your needs, all you have to do is the initial data input.

A simple click of the mouse will then launch the programme. You don't even have to remember when the computation finishes as an e-mail will let you know when the process has finished.

What's more, Dengi lets you access your results whenever and from wherever you like. Dengi's archiving system allows access with an internet browser without the need to install dedicated plugins. The security of your data is ensured by the portal's authentication system: only you can access your data.
Dengi also offers a great opportunity to companies.
Would you like to propose an application for inclusion on the portal?
Get in touch and give us a full and serious analysis for the integration of your application on the portal.

If you are happy with our proposal you'll have the chance to exploit our computer lab for the implementation of the software throughout the portal. This is an opportunity for companies with great technical know how but little computing knowledge to exploit the potential of their ideas in tandem with Dengi.

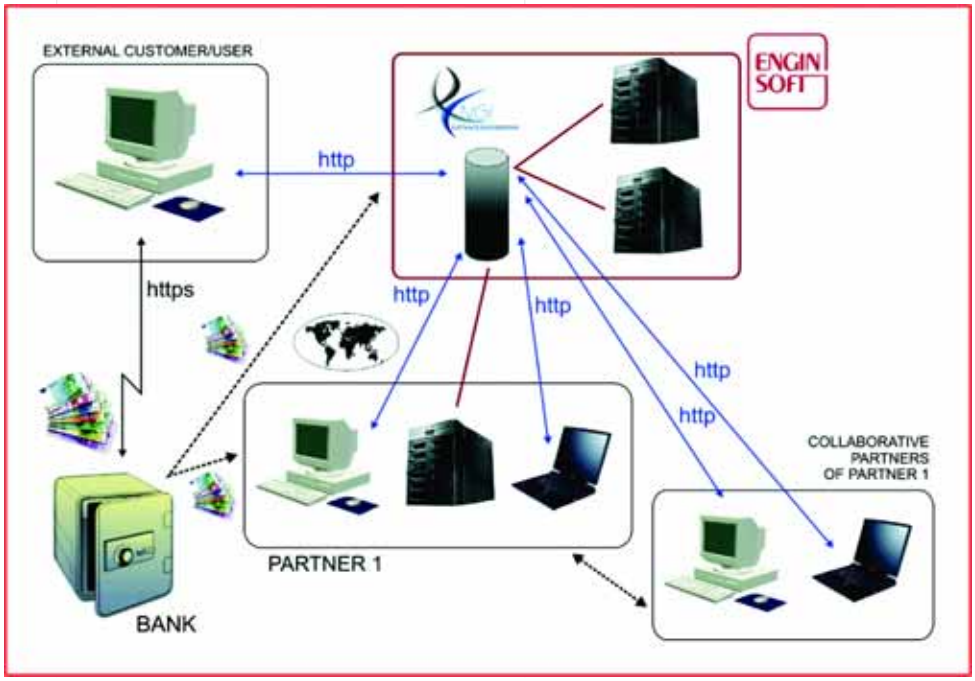
By integrating your applications in our portal you can exploit its innumerable advantages which include:

- ability to use your applications anywhere, anytime;
- income from the use of your software by third parties without having to supply installations and avoiding problems of pirating and unauthorized copies;
- protected, high securtity storage of your data.

Dengi therefore lets you share your engineering applications over a number of sites or among a number of companies.
This results in the standardisation of computing systems to obtain homogeneous data and, in the case of their use by your partners, in imposing quality standards also during the design phase.
In addition, Dengi can become a source of profit for the companies that decide to let third parties use their applications without having to take on the typical problems of software distribution and so avoiding assistance with installation, piracy, the coping of code by competitors, and so on.

Dengi is your ideal ally for your software. Contact our consultants for more information and to discover the many advantages our portal can offer your company.

For more information:
dengi@enginsoft.it



Optimization of Gas Turbine Combustors

An Integrated Design Approach for Gas-Turbine Combustors by means of Game-Theory Optimization Strategy

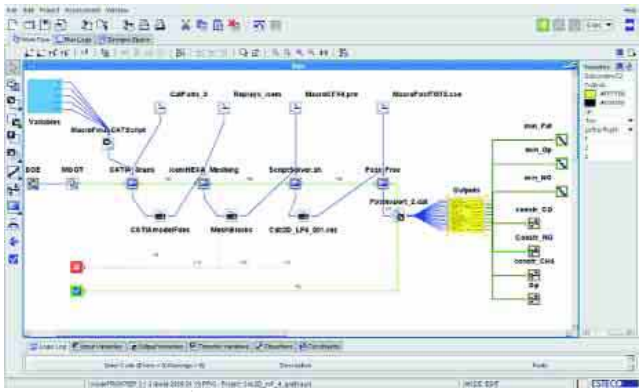
The present work describes a novel approach for the optimized design of gas turbine combustors, that integrates a 0/D code, CFD analyses and an advanced Multi Objective Game Theory optimization algorithm.

Methodology

A proprietary 0/D code produces the baseline design of any generic combustor, given the required performances of the G.T., the machine characteristics, the fuel type and

properties, the basic geometry (tubular or annular) and the combustion concept (i.e. lean premixed primary zone or diffusive processes). The following step is the optimization of the baseline design. For that purpose, a parametric CAD and mesh model should be prepared, as well as the needed set of macros to run the CFD analysis and post-process the results in batch mode.

Free parameters of the optimization process are position and size of the liner holes arrays, their total area and the shape of the exit duct. The three different objectives are the minimization of NOx emissions, pressure losses (Dp) and combustor exit Pattern Factor (Paf). This last index is a measure of the temperature uniformity of the produced gas flow. The lower it is, the better it is, specially in terms of thermal stress for the following turbine blades.



The previously described approach was applied to the design of a tubular combustion chamber, with a lean premixed primary zone, for a recovery methane-fuelled small gas turbine of the 100 kW class. As a comparison term for the results, a similar combustor was chosen out of the recent technical literature (2004).

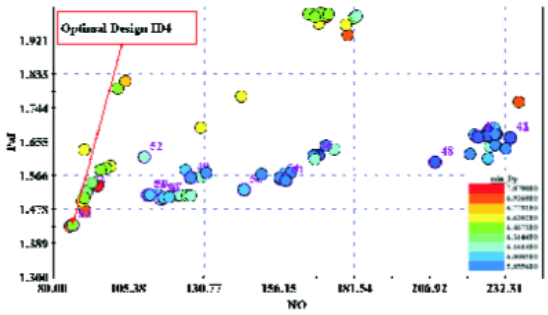
All the computational chain from the numerical definition of the variables' values to the results handling was automated by means of:

- a parametric CAD model of the device (CATIAv5 scripting language);
- a robust hexahedral multi-block meshing (ICEM CFD);
- a batch-mode use of the CFD solver, with automatic post-processing (ANSYS CFX).

The workflow automation and data handling, as well as the optimization engine, is provided by the modeFRONTIER optimization tool.

The time and computational resources constraints allowed the authors to perform not more than one hundred different design evaluations: for this reason the modeFRONTIER's efficient and robust Multi Objective Game Theory algorithm was selected.

The optimization was carried out in an automatic and efficient way by modeFRONTIER, exploiting the distributed computing concept via queuing system. Parallelization was applied both to the single computation, and to the optimization itself.

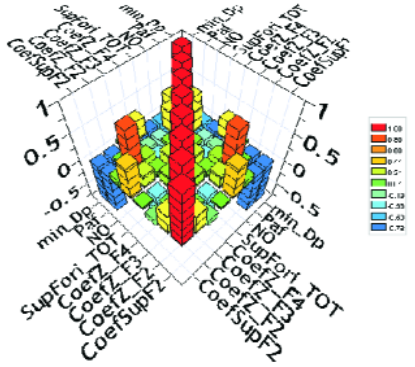


Results

- dry-low-emissions concept implemented;
- pressure losses less that 6%;
- high temperature uniformity in the outlet flow: Patter Factor reduced of 40% respect to the reference combustor.

	ΔP %	Ch. ppmvd@ 15%O2	CO ppmvd@ 15%O2	NO ppmvd@ 15%O2	PaF
State-of-art combustor (same concept, Y2004)	>6	1.1e-2	1.6e-2	9.1	0.44
Optimized design	**5.9**	**4.6e-6**	**4.0e-1**	**11.6**	**0.25**

The statistical analysis tools of modeFRONTIER were used to perform sensitivity studies of the considered parameters on the combustor performances, while a stochastic robustness analysis of the found solution is currently under progress.



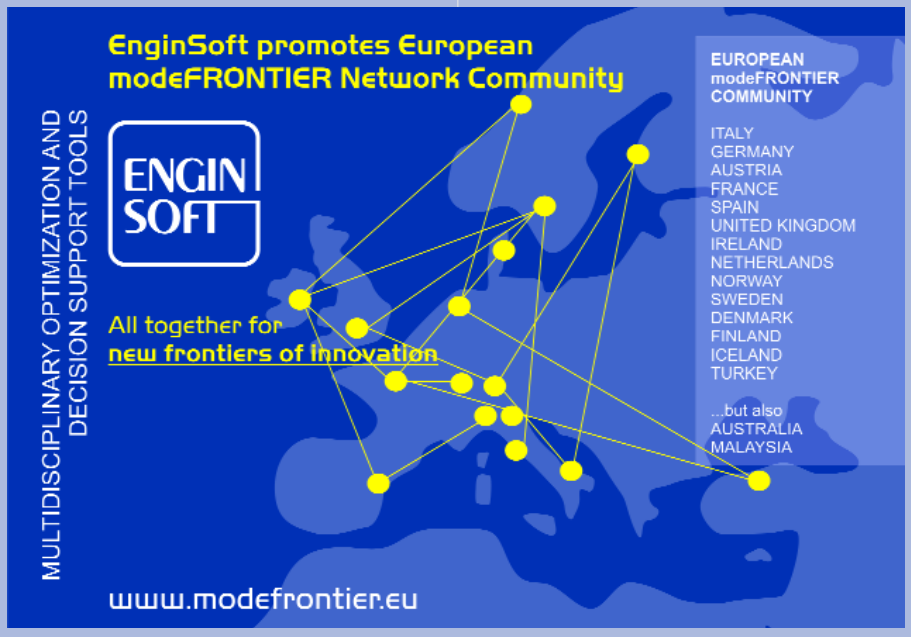
Case Studies

EnginSoft promotes modeFRONTIER in Europe

As one of the founders of ES.TEC.O, EnginSoft Optimization Technologies S.r.l., having been involved in the foundation and development of modeFRONTIER from the very beginning, EnginSoft has always put great emphasis on establishing strong business networks to further explore business opportunities and to gain market share.

Whilst ES.TEC.O headquartered in Trieste is responsible for the development of the technology, EnginSoft today promotes modeFRONTIER business through a hybrid network of subsidiaries in Europe and USA, as well as through partner channels - distributors, software producers - in these and other territories. In fact, the network of subsidiaries can be seen as 'corporate branch' of the EnginSoft line of business devoted to PIDO (Process Integration and MDO), and hence is called ESTECO.

In this Newsletter issue, we are very pleased to present our initiatives and recent opening of business operations for modeFRONTIER in such important markets as Germany, the Nordic countries, Spain and the United Kingdom. We are confident to succeed in these markets given our world class multi-objective optimization platform modeFRONTIER combined with the local teams of experts, expertise and commitment in place!
For more information about modeFRONTIER business in Europe, please visit:
www.modefrontier.eu



EnginSoft and modeFRONTIER network community

In October 2004, EnginSoft has further increased its involvement in the international sales of modeFRONTIER by appointing Paul Grootendorst, as 'Business Development Manager Europe'. The aim is to further expedite the expansion of modeFRONTIER business in Europe. Paul has a long experience in building and maintaining resellers networks for new products.

Since its appointment, Paul has built relationships with many partner companies in various countries. Given the multi-purpose nature of modeFRONTIER, we believe it is important to have local partners with expertise in specific engineering fields such as CFD, fluid-systems, vehicle dynamics, crash, structural analysis and more.

Apart from building and maintaining relationships with independent distributors, EnginSoft has now set-up local representative offices in the most important regions in Europe, thus allowing us close contacts to our customers for offering pre- and post-sales support.

Design Optimization is the next step after analysis. Increasingly capable CAE tools and powerful hardware are facilitating the use of process integration and optimization to CAE Users nowadays.

EnginSoft is investing today to make sure that modeFRONTIER continues to play a dominating role in the international market place!

For more information:
info@modefrontier.eu

modeFRONTIER in France

EnginSoft and SIREHNA form ESTECO France

Looking beyond 5 years of fruitful cooperation, EnginSoft and SIREHNA are delighted to start business operations as ESTECO France in autumn 2006. Besides marketing and direct sales, ESTECO will from now on coordinate distribution activities - in a European context - between various business players in France, such as Cetim and Tass.

SIREHNA is an independent company involved in consultancy and R&D for twenty years that is in particular dealing with :

- European and National research projects about MDO (Multi-disciplinary Design Optimization)
- Studies involving MDO in the marine, automotive, aeronautic and industrial fields
- Distribution of CAE related software, and in particular modeFRONTIER

Jean-Jacques MAISONNEUVE is our Project Engineer for simulation related fields. Jean-Jacques has significant technical expertise in modeFRONTIER and is the expert for MDO at SIREHNA.

When it comes to CAD and mechanical calculations and optimization, Fabian PECOT is our dedicated expert in charge. Fabian also supports us as Project Engineer.
Yves-Marie LEFEBVRE is our Project Engineer and expert for CFD. In his role, Yves-Marie is also responsible for CFD pre and post-processors marketing (FieldView and GridGen).

Finally, Fabrice PERONNO is our Sales Engineer for modeFRONTIER.

The French market for optimal design tools is still young. A significant growth is expected, as many major industrial actors, in particular in the automotive and aeronautic fields, are now strongly investigating these approaches. This increase in need must be supported by actions aiming at demonstrating the applicability of these techniques to all industrial fields, and enhancing their capabilities to fill in some of the gaps that are still remaining.

In this context, SIREHNA is currently leading the research and development project MDO-EMC2 which is partly funded by the French government and expected to disseminate optimal design technologies in the maritime and automotive domains, in cooperation with some regional industrial partners such as DCN, Barre THOMAS and MECACHROME. Moreover, we are involved for many years in other national or European R&D projects aiming at promoting and extending the applicability of optimal design.

Our modeFRONTIER customers to date span various industries from aeronautics (Onera, Giat and other), automotive (e.g. Honda Racing, Michelin) to maritime (DCN Toulon and Lorient, BEC and more) and miscellaneous (Air Liquide, St Gobain, Novachem). In addition, many academic licenses have been supplied, especially in the maritime sector all over Europe.

One of the most successful exploitation of modeFRONTIER is currently performed by Bassin d'Essais des Carènes (BEC). The company uses modeFRONTIER routinely in the ship hull design process, in association with specific potential flow and RANSE solvers, on the basis of 6 licenses running on a cluster of PC.

We work closely with ECN / IRCCyN on a number of topics related to optimal design, in particular through R&D projects. We also support relationships with other French or European universities linked to research or networking activities.

Given the above, a growing number of customers in various fields and many national and European research and development projects, we are proud to contribute to the success of modeFRONTIER in France and Europe !

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modeFRONTIER in Sweden, Denmark, Norway, Finland and Iceland

ESTECO Nordic founded in August 2006

Shortly after business operations have started, ESTECO Nordic will move to its new base at IDEON Science Park in Lund in November 2006. The proximity to Copenhagen Kastrup International Airport, Scandinavia's main gateway to the world, will be an essential factor in expanding business to a territory as large as the one foreseen for ESTECO Nordic.

Further advantages are without doubt the office's central location within Öresund, an area of high economic expansion and the closeness to Gothenburg and its strong automotive industry.

Håkan Strandberg, MSc Mech Eng, brings in 10 years working experience with FEM to ESTECO Nordic. He was in charge of Sales of ANSYS CAE Software for 8 years.
In this role, Hakan acquired key accounts and established relationships with companies such as Volvo, SAAB, Nokia, Sony Ericsson, TetraPak, Alfa Laval and Metso.

Åke Burman, Phd, with 20+ years experience from numerical simulations, founded Validus Engineering in 1987, a consultancy firm specialized in structural analysis, crash, CFD and MBS analysis. Validus' client base comprises, among others, Volvo Aero, Westinghouse, Maersk Olie og Gas, Norsk Hydro, Tetra Pak as well as Nikon and Canon in Japan.
Still today, Åke contributes 20 percent of his time to the Department of Machine Design, Lund Institute of Technology, this connection dates back to his full-time engagement in 1985. Åke also supports strong ties to the Department for Civil Engineering of Carnegie Mellon University, Pittsburgh, PA since his involvement as "Visiting Professor" in the years 1995-1997.

The main industries for modeFRONTIER in the Nordic market are certainly automotive, aircraft, heavy machines (paper), defence, oil & gas and electronics. We address the biggest potential specifically in crash and defence whereas we consider electronics also worth investigating.
How we place ourselves remains to be seen in the months ahead and requires evaluation and review at a time when we have experienced first reactions from the market and prospective customers.

We intend to establish ESTECO Nordic as a complete supplier of software, training, support and related services.

A case study already made by TetraPak in Modena, Italy could lead to a promising start as the company's headquarter is located in Lund, just a stone throw away from our office.

We work with Engstrom Dynamics AB, for Adams, and consider collaborations with other companies. We plan to determine and define the nature of these relations in the next 2 months. Strong ties already exist at this point in time with Validus Engineering, Åke's own firm. Validus supports us in knowledge transfer and may open doors to pilot projects in appropriate cases and applications.

We see a lot of potential for modeFRONTIER in PIDO Process Integration and Design Optimization. It will be very interesting to work in one of the fastest growing CAE market segments. – We look forward to exploring these challenging opportunities in the months ahead !

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modeFRONTIER in United Kingdom

Business operation commenced in January 2006

EnginSoft is pleased to collaborate with Icon Ltd, an independent simulation services company, to establish and develop modeFRONTIER business in the United Kingdom. For more than a decade, Icon has successfully delivered support and expertise in Computational Fluid Dynamics (CFD) and Computer Aided Engineering (CAE) as well as in the application and development of multimedia and Internet technologies.

Icon and its team of skilled engineers is determined to rapidly develop and maintain the modeFRONTIER customer base in the UK while providing unrivalled support and expertise in the field of automatic optimization. This will be achieved through the formation of the ESTECO UK Ltd business.
ESTECO UK's main office is located in West Kensington (West London), allowing easy access to the rest of the UK via road, rail and air.
In February 2006, David Green was appointed Commercial Director of ESTECO UK. Based in Coventry, thus enabling easier access to the northern part of the country, David is responsible for defining and executing Sales and Marketing plans for modeFRONTIER in the UK market.

The ESTECO UK team of experts includes Paolo Geremia. Paolo acts as Technical Specialist who coordinates and provides an extensive range of direct support to our customers for modeFRONTIER. When it comes to CFD simulations involving modeFRONTIER, Francisco Campos is Icon's dedicated Technical Expert in charge. Finally, Simon Weston holds the position of General Manager at Icon. In his role, Simon is responsible for installing and developing an overall business infrastructure that is essential for providing support to the client base.

modeFRONTIER business is diverse and can be foreseen anywhere from Scotland to the City of London. However, the main local industries are without doubt:

- Aerospace: Airbus-UK, Rolls-Royce, BAE Systems, Pall Aerospace, Dunlop Aerospace
- Automotive: F1 companies (Renault, Williams, McLaren, Midland-F1), Jaguar/Land Rover, Mahle (formerly Cosworth Technology)
- Defence: Qinetic
- Areas of Application: CFD - 4 major CFD software tools all originated in the UK (STAR-CD, Fluent, CFX, OpenFOAM)

Another target area we see for the future is the Financial Sector in the City of London. We also cover and support the Australian and South African markets from our UK office due to similarities in language and cultures. Some of our customers to date include Air International based in Melbourne, Australia, Jaguar Cars in Coventry, UK and Midland-F1 Racing Limited located in Northamptonshire, UK. We are encouraged by the fact that Audi AG has chosen modeFRONTIER when performing a CFD optimization case for the new Audi TT. We believe this may lead to further opportunities in the automotive sector.
To strengthen our position on the market, ESTECO UK collaborates intensively with Icon. They assist us in providing independent technical capabilities that allow modeFRONTIER to be professionally and efficiently introduced into customer processes.
A close cooperation also exists with TNO Automotive TASS who act as modeFRONTIER distributors. Also based in Coventry, they are specifically focussed on the occupant safety market. Jaguar and Land Rover are some of the strategic automotive customers located in the same area.
Optimization technology is a new concept to many prospective customers. It remains to be seen how enthusiastic individual local markets are about introducing new technology or replacing existing software. We are aware that how well we coordinate and communicate our commercial and support efforts will be critical in acquiring and maintaining new customers. To succeed in this challenge, our activities include collecting and presenting reference accounts and papers, exhibiting and presenting our technical capabilities at conferences and seminars. Furthermore, we are leveraging other software companies, e.g. CD-adapco and ANSYS UK for joint seminar initiatives. We are convinced that we are selling a very good piece of software and we are positive about the future and the demand for automatic optimization.

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modeFRONTIER in Germany

ESTECO GmbH founded in December 2005.

ESTECO GmbH is based in Rottenburg/Neckar, 30 minutes from Stuttgart, at the heart of the German automotive and automotive supplier industry. Prominent local automotive OEMs and suppliers include DaimlerChrysler, Porsche, Robert-Bosch, Behr, Mahle, Modine.

Frieder Semler is the Managing Director of ESTECO GmbH. Frieder has 18 years experience in CFD consultancy. He held the position of Managing Director of AEA Technology GmbH (CFX) from 1993 to 1998.
In 1998 he founded CFD Consultants GmbH of which he is a Managing Partner. Our team further includes René Thümmler of CFD Consultants who is responsible for user support. René has provided consultancy services using modeFRONTIER to Audi AG in the past year. To expand business further, a Sales Engineer will be hired shortly. German car manufacturers need to differentiate themselves from the competition by technical excellence. It is for this reason that the automotive industry is the most interesting market segment for optimization software in Germany. When it comes to the German market and technical software, a convincing technical solution is a prerequisite for successful selling. In other words, we need to possess good knowledge of optimization and have a sound application knowledge in various areas such as structural analysis, CFD, multi body dynamics etc. We aim to accomplish this by partnering with institutions active in these areas, for example CADFEM, FLOWMASTER, INTEC and others.

Our customer base to date comprises

- Audi AG, DaimlerChrysler AG, Modine Europe GmbH, Sulzer Innotec, Toyota Motorsport GmbH
- German Aerospace Center (DLR)
- Institute for Vehicle Dynamics, BTU Cottbus; Institute for Fluid Dynamics (LSTM), Erlangen; Institute for Internal Combustion Engines (VKM), RWTH Aachen

Toyota Motorsport GmbH and Audi AG increased the number of licenses and intensified the use of modeFRONTIER.

We collaborate with Prof. Rösler of FHTE Esslingen who acts as independent "sales consultant" and we plan to engage another expert from University of Cooperative Education Mosbach in the same way. We support people at the Institute of Internal Combustion Engines and Automotive Engineering (IVK) of Stuttgart University who are using modeFRONTIER in conjunction with FLOWMASTER in the project 'Optimized Thermal Management'. In this context we are also aiming at a partnership with FLOWMASTER GmbH. We are very optimistic about the future given the excellent product modeFRONTIER and our presence on the German market that we have established to date. We look forward to expanding business further in the months and years ahead.

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modeFRONTIER in Spain

APERIO Tecnologia is currently based in Sitges, near Barcelona, Spain's door to Europe and one of its most progressive cities, known for its spirit of innovation and economic development.

Dr. Gino Duffett will be conducting modeFRONTIER business on behalf of EnginSoft. Gino possesses over 20 years of experience in FE simulation as software developer, project manager, R&D manager and supplier of services and software.

We see opportunities in the general engineering market, in particular in the aeronautics, energy and construction industries. Another challenging field is bio-mechanics, bearing in mind modeFRONTIER's previous successes in this sector.

Once we have established business operations in the Barcelona area, we shall aim at entering into sales collaborations with other modeFRONTIER vendors in Europe. We believe this will strengthen our position in the local market, specifically when it comes to the point of approaching larger European-wide active corporations and prospective customers.

modeFRONTIER's potential is large due to its generality and capability of optimizing almost anything! The ability to couple modeFRONTIER to any software is particularly attractive to many engineers. All of this opens doors to many opportunities - we look forward to starting operations and launching modeFRONTIER in Spain!

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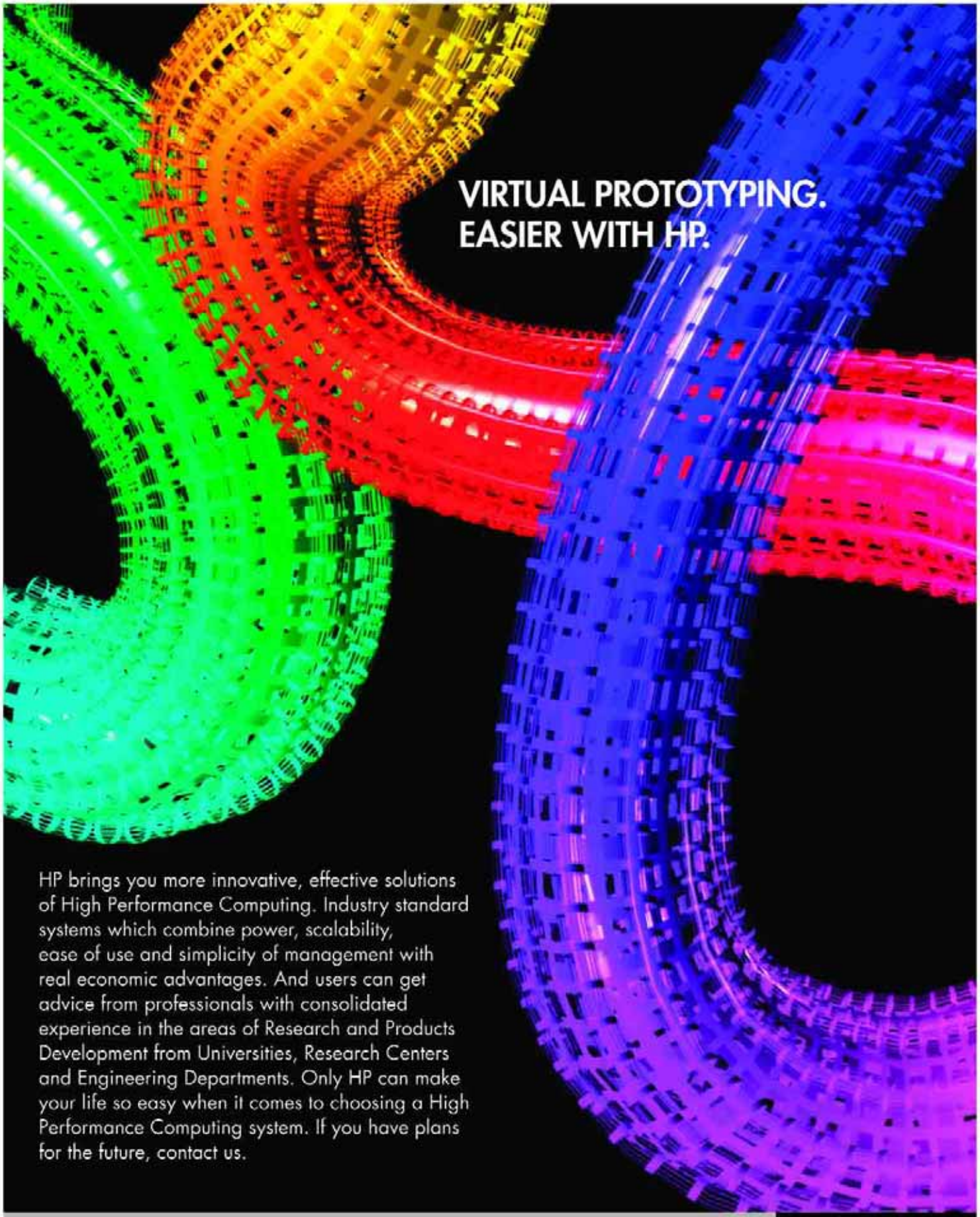

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ANSYS signs definitive Agreement to acquire Fluent, thus broadening its offerings in the Simulation Market

ANSYS (Nasdaq: ANSS), a global innovator of simulation software and technologies designed to optimize product development processes, recently announced it has signed a definitive agreement to acquire Fluent, Inc., a global provider of computer aided engineering (CAE) simulation software.

ANSYS expects the acquisition to be immediately accretive to earnings, excluding acquisition-related costs, amortization of intangibles, the impact of deferred revenue purchase accounting treatment and expensing of stock options. The company used a combination of existing cash and proceeds from approximately $200 million of committed bank financing to fund the transaction.

Fluent, Inc. is a global supplier of CAE simulation software technologies and services. Fluent products utilize computational fluid dynamics (CFD) principles and techniques to enable engineers and designers to simulate fluid flow, heat and mass transfer, and related phenomena involving turbulent, reacting, and multiphase flow. The company's products are used by blue chip companies, small and medium sized enterprises, and academic institutions and institutes around the world. Today, CFD simulation technology is used in almost every industry sector and manufactured product.

"With the acquisition of Fluent, ANSYS has significantly broadened its offerings in the simulation market. I expect ANSYS to be an important partner to design engineers in industries, from discrete manufacturing, oil and gas, chemicals, food processing, as well as to environmental scientists studying how pollution propagates and oceanographers trying to predict the effects of global warming.

Ships, airplanes, cars, your PC, home, office building and the environment - all will work better, be more efficient, pollute less or be better managed as a result of a better understanding of the dynamics of the gases and liquids in which, and with which, they operate," commented Daratech CEO Charles M. Foundyller.

Jim Cashman, ANSYS President and CEO added, "Finalizing the acquisition of Fluent is great news for us, our customers and partners. We are very excited to be able to move forward today as a unified company and begin executing our strategy for the future." "With the operations and technology synergies that Fluent and ANSYS share, we are confident that we can meet the needs of the CAE community for simulation software and services in a highly effective manner," said Dr. Ferit Boysan, Vice President and General Manager, Fluids Business Unit.

The combination of ANSYS' and Fluent's software products and services is expected to give ANSYS one of the most comprehensive, independent engineering simulation software offerings in the industry, reaffirming and strengthening ANSYS' commitment to open interface and flexible simulation solutions that are primarily driven by customer demand and choice. With over 40 direct sales offices and 17 development centers, on three continents, the combined company will employ approximately 1,350 people. A presentation describing the transaction is available on the ANSYS website at: www.ansys.com

About ANSYS, Inc.

ANSYS, Inc., founded in 1970, develops and globally markets engineering simulation software and technologies widely used by engineers and designers across a broad spectrum of industries. The Company focuses on the development of open and flexible solutions that enable users to analyze designs directly on the desktop, providing a common platform for fast, efficient and cost conscious product development, from design concept to final-stage testing and validation.
The Company and its global network of channel partners provide sales, support and training for customers. Headquartered in Canonsburg, Pennsylvania U.S.A. with more than 40 strategic sales locations throughout the world, ANSYS, Inc. and its subsidiaries employ approximately 1,350 people and distribute ANSYS products through a network of channel partners in over 40 countries.

Visit http://www.ansys.com for more information.

New MAGMAfrontier module

Automatic optimization is no longer a dream but a reality available to all foundry designers.

MAGMAfrontier is the answer to the dreams of many foundry and technology designers, namely to use computer simulation to automatically optimize the casting process without having to go through a time-consuming series of manual trial and error guessestimates and to produce ample documentation to justify alternative options.

MAGMAfrontier deals with the subject both in relation to the optimization of process conditions and the parameters of production and methods, for a wide range of casting processes. In every effect, the solution is a MAGMASOFT® module that requires the base version 4.4. of the software to run and which uses, like all the other modules, the database.

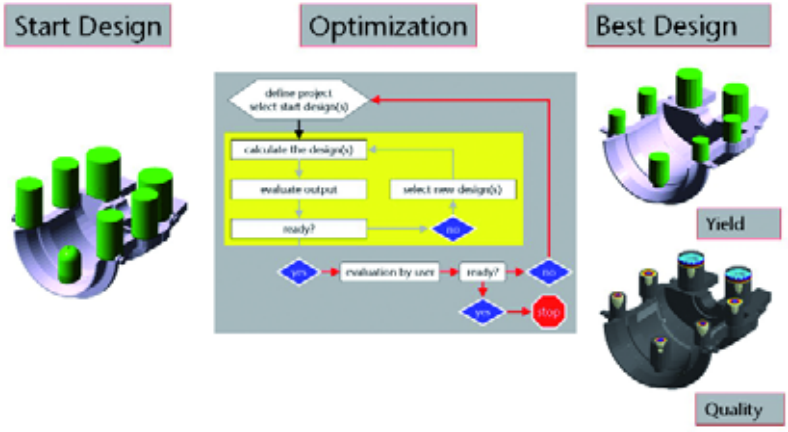
Overview

MAGMAfrontier uses the original modeFRONTIER architecture and the optimization routines that implement, through the user interface, the full integration between the two systems and is perfectly homogeneous in the usual user software environment. The user is guided through the definition of the process parameters that can be modified, as well as the associated accepted variation intervals, in the definition of the optimization objectives and the limitation and the evaluation criteria. The system then automatically launches a series of technologies present in the module for the identification of the optimized solution. This operation, thanks to series of technologies available, is undertaken keeping the computing needs within very tight limits.
The strategies chosen for optimization belong to the family of evolutionary algorithms that are able to deal with the problem of different and conflicting objectives at the same time, this being a characteristic of most of the decisions that have to be taken in the foundry when the need is to obtain the best compromize for an efficient casting technique.

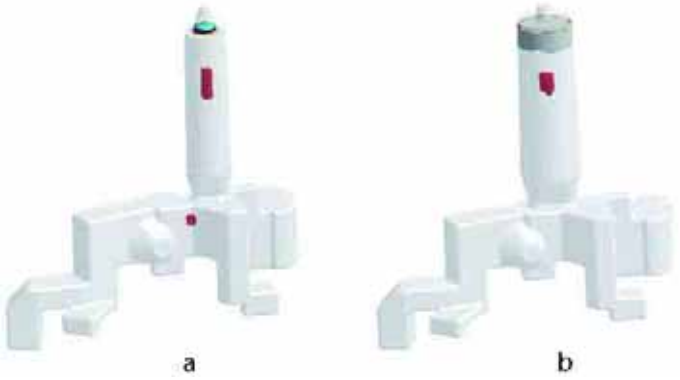
Opportunity

MAGMAfrontier takes on the problems of optimization that are typical in the foundry:

- Optimization of the feeding system, maximum reduction of shrinkage porosity in the cast through the optimal positioning and sizing of the feeders with, at the same time, the optimization of productivity.
- Optimization of the casting system: balanced filling without turbulence thanks to the optimal sizing of the casting gating systems.
  Homogeneous distribution of the fluid during die filling.
- Optimization of the process: minimisation of thermal loads within the equipment thanks to thermal regulation, lubrification and optimal shake out time with simultaneous optimization of productivity (increase equipment life).



Optimization process with MAGMAfrontier. Based on a selection of start designs with certain degrees of freedom and manufacturing limitations, the optimization algorithm analyses various objectives at the same time. In this example casting quality and returns.



Feeder optimization for the prevention of porosities. (a) initial situation (b) optimized result.

- Optimization of the forming method taking into account at the same time the properties required for the casting to be produced.
- Optimization of the stresses and distortions in the casts: minimisation of distortions due to residual stresses.
- Inverse optimization: identification of the properties of the material and the process parameters on the basis of the experimental data available.

Evaluation tools

Multi-objective optimization is a complex process to be specialized to the application. For this reason there are numerous tools available, including:

- Identification of the optimized solutions (Pareto frontiers).
- Dispersion diagrams.
- Calculation of the sensitivity of output values in respect to input values
- Analyses of variation range.
- Data analyses for inverse problem solutions
- Graphical representation of target functions and the generation of diagrams.
- Representation of the development of distribution variables / frequency.
- Statistical and graphical analysis of limits.
- Visualisation of optimization progress.

MAGMAfrontier uses modeFRONTIER 2.5 and is available for all operating systems and for single or double processor platforms, as well as Linux PC clusters.

MAGMA e MAGMASOFT® are the registered trade marks of MAGMA Geissereitechnologie GmbH.
modeFRONTIER is a registered trade mark of ES.TEC.O srl.

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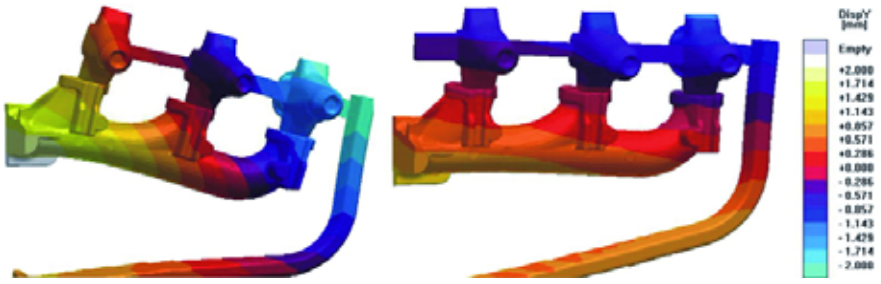
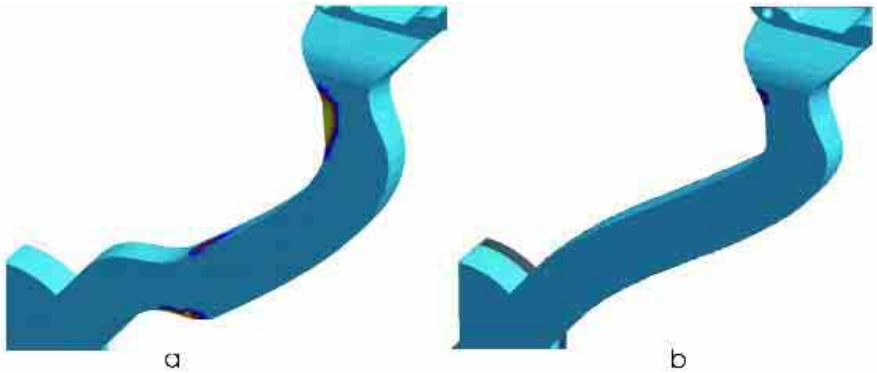


Casting distortion before and after the optimization of runner designs. Varying the web width of the runner between the individual feeders leads to different rigidities and shrinkage constraints of the component. The distortion of the bend was significantly reduced after taking these measures.



Optimization of a runner in high pressure die casting. MAGMAfrontier optimizes the geometry of the runner with the aim to reduce the amount of entrapped air during the filling process. (a) bad design with areas of entrapped air (b) optimized geometry of the runner.

Engineering and Services

Optimal Casting Solutions

Competing today requires a strong knowledge base. EnginSoft Engineering and Services is a group of casting experts that has the right technologies available for working with foundries and companies finding solutions to metal casting challenges. Our metallurgists, process engineers and mechanical engineers are committed to assist in:

- Interactions between design and production processes
- Prediction of casting properties for designers
- Integration of process simulation into the Design Chain and FEA validations
- Optimization of part design
- Involvement in prototype castings and process development
- Production development and optimization

With our CAE tools and knowledge we are able to predict the complex, often hidden aspects of the casting process, supporting our customers in the achievement of continuous improvement, streamlined productivity, top quality and cost reduction.

For more information:
services@enginsoft.it

New shareholders for LINFLOW

EnginSoft, together with CADFEM, FIGES, IDAC UK and IDAC Ireland, acquires shares in LINFLOW

EnginSoft is participating in the refinancing and international re-launch of LINFLOW with the purchase of 15% of the share capital of the new software company. Other partners, of EnginSoft and TechNet Alliance Members, including CADFEM, FIGES the English and Irish IDAC have also taken stakes, thus confirming their interest in a technology that, albeit very specific, has interesting potential applications.

LINFLOW is a software for the CFD analysis of fluid-structure interactions in the presence of non stationary but non viscous flows. In aerodynamics, the package is known for aeroelasticity applications, that is to say for the study of the interactions between structure and aerodynamics and the instability that can derive from the coupling between aerodynamic flow and structural dynamics.

LINFLOW can also be applied to acoustic analysis (with the possibility of defining the conditions of complex acoustic impedance and function of frequency), the analyses of the interactions between stability and vibration of fan blades and, as an initial tool, the preliminary fluidodynamic study of vehicles and aircraft (external aerodynamics, both stationary and not stationary). Other possible areas of application are the study of sails and the effects of wind loads on buildings. From a numerical point of view, LINFLOW is based on BEM (Boundary Element Method) that is generally thought to be more efficient for non stationary /acoustic aerodynamic calculations compared to finite element or finite volume methods.

The application of LINFLOW generally requires negligible vorticity as in the case of smooth flows (linear acoustic), or a confined vorticity of the fluiddynamic field near thin surfaces, such as for example, the wake of aerodynamic bodies immersed in low incidence flows and high Reynolds Numbers. At present it is possible to consider compressible flows, but only at subsonic speeds.

The greatest advantage, and the most surprising aspect of the software, is its significant content of useful information from an engineering point of view which can be taken from LINFLOW and applied in some other applications at a low computational cost when compared to the more sophisticated CFD Navier-Stokes codes. In the same way, LINFLOW can use information from ANSYS CFX, representing a possible integration.

Some LINFLOW users: Piaggio Aero Industries, Norsk Hydro, Statoil, Delta Marine, SAAB Bofors, GE India, Porsche, China Aero Industries.

EnginSoft is the exclusive distributor for Italy and Spain.

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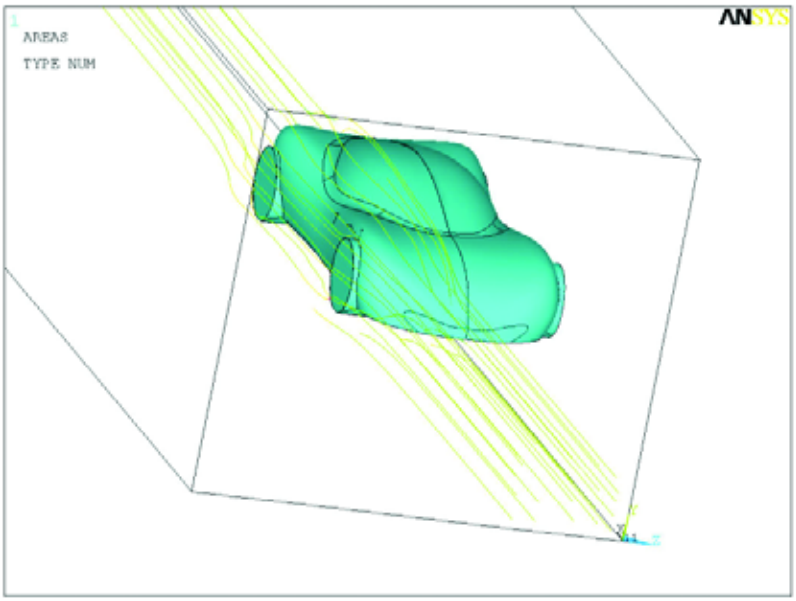
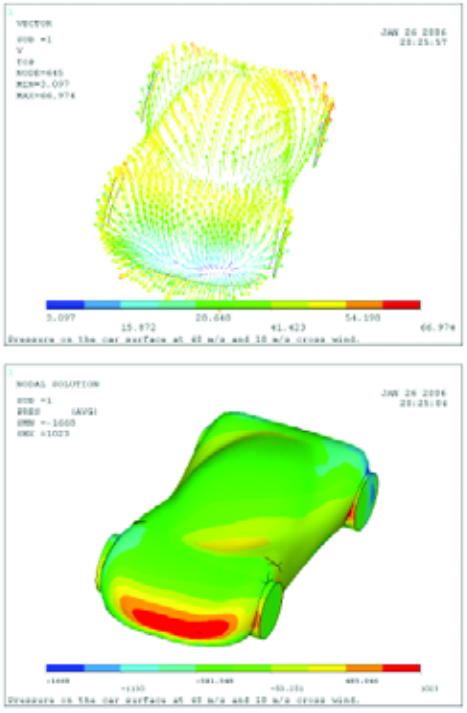


Flow domain visualization with LINFLOW.



Cross flow result plots.

Musculoskeletal modeling: A new type of CAE

The AnyBody® Modeling System is a unique type of CAE software for biomechanics and computer-aided ergonomics.

It computes the influence of the environment on the human body. And AnyBody models not just the body, but also the objects it interfaces to: the seat and the crank mechanism of a bicycle or the steering wheel and gearshift of a car. With AnyBody, you can investigate in detail the ergonomic consequences of design parameters.

Models in AnyBody are parametric and scalable. It is easy to change the strength of a muscle, the length of a skeletal bone, or the direction of an exterior force. And AnyBody does more than that. The system can optimize the model and automatically find the combination of parameters that best fulfil a given purpose: the dimensions of a bicycle that minimize muscle fatigue for given rider dimensions.

Use AnyBody for:

- Ergonomic design
- Design of rehabilitation technology
- Planning of orthopaedic surgery
- Physiotherapy planning

- *Improve innovation of products for humans*
- *Improve usability of existing products*
- *Improve ergonomic documentation*
- *Reduce cost for prototypes*
- *Improve time-to-market*

ANYBODY TECHNOLOGY

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Pressure Die Casting Machines: Setup and Optimization of the Process using modeFRONTIER

The use of new generation software tools for the automatic choice of optimal process parameters is an important innovation for pressure die casting. This paper describes the application of modeFRONTIER software to the management of both the operative aspects of the process parameters (the distribution of production orders to the presses available in the department), aspects related to the optimization of the process parameters (die heat balance to define the quality range for the cast), and the definition of scenarios for the integration of the process parameters, optimizer and retroaction on the press to re-enter in the production quality standards.

The automation of a production plant has been, and will continue to be a priority objective for modern industry in order to improve and ensure product quality and increase the productive efficiency of the transformation processes. In the case of the foundry, plant automation requires each individual phase in the production cycle be controlled by programmable logic (PLC) and that the modularity and repeatability of the actions permit the adoption of mechanized devices. Beyond any shadow of doubt, the pressure die casting plant is ideal for the implementation of specific functions such as logic, sequencing, timing, counting and calculation for the complete control of the process and the product.

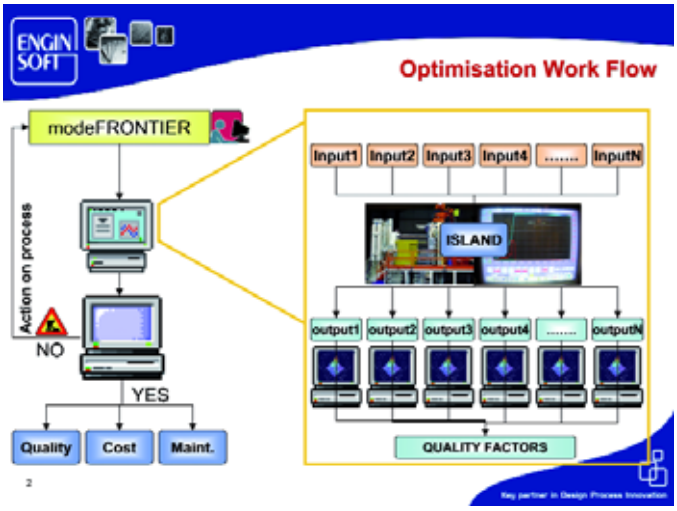
The electronic systems and digital functioning are today adopted within the single areas of the pressure die casting plant: the press, the transport robots, the lubrication and blower arm, shearing press, finishing systems and safety devices. However, each area has a different PLC that has to be integrated and synchronized with the others and so it is necessary that the machine operates as a single plant with a control system at a higher, such as company, level.

modeFRONTIER software can easily interface with different local control systems, on individual machines and processes and thus become a 'controller' of the pressure die casting plant as well as all the production equipment or the entire factory for the set up and optimization of the production of single products and the monitoring of the efficiency and costs, and the management of production orders. modeFRONTIER has all the functions needed in that it:

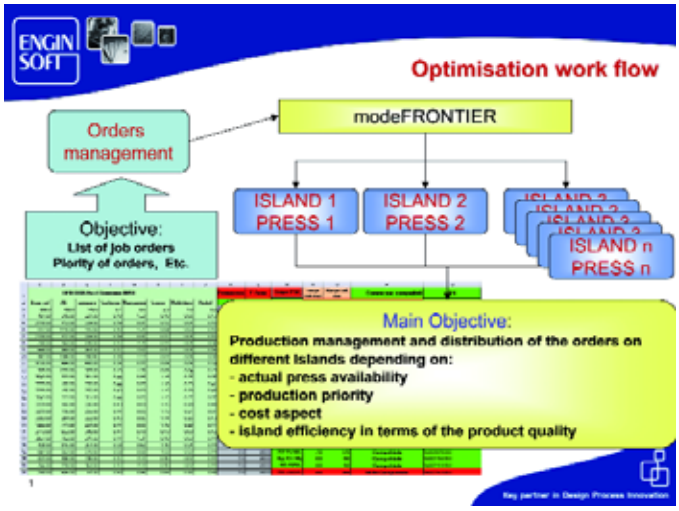
- is able to connect local control systems and manage the logic sequence of the operations;
- is complete with methods of the design of experiments (DoE);
- offers a massive variety of algorithms for the multi-objective optimization;
- provides summary descriptions of phenomena (and their reciprocal influences) with response surface methods (RSM);
- allows statistical approaches, evaluations and optimization;
- contains Multi Criteria Decision Making (MCDM) decision support methods.

DESCRIPTION OF THE MACHINERY MANAGEMENT FLOWS

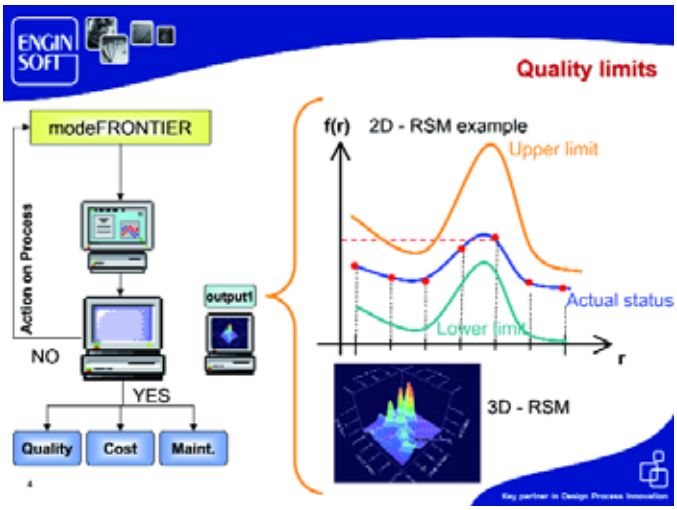
The condition for the use of control and optimization tools is that each



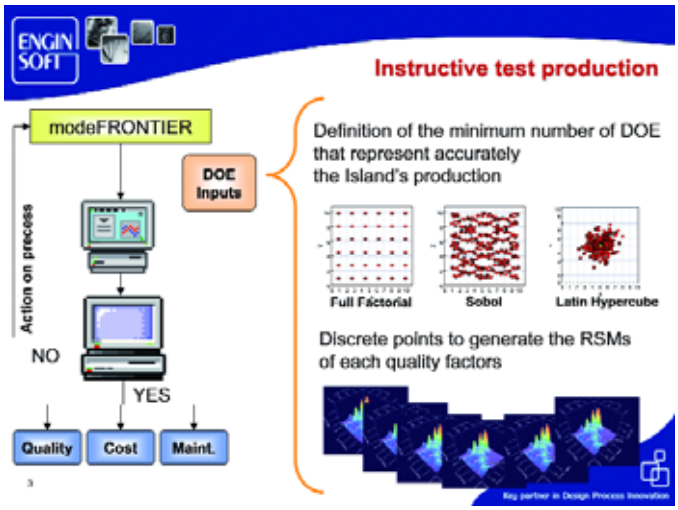
1a) The Overall Process Control



1b) Acquisition of orders and Distribution of work load



2a) The DOE and RSM phases



2b) QA and Retrofit

operation, equipment and mechanism of the pressure die casting machinery can be described by a group of logic and numerical data that represent the productive processing details from the molten metal to the finished piece (fig. 1 a). The first information for production comes from the customer's order which gives the geometric and mechanical specifications of the piece to be produced. Taken that press-product relationship has been optimized in terms of cast quality, high productivity and cost reduction, the system installed on the company's server is able to acquire the list of orders and distribute it to the various machines on the basis of the work load, press capacity and internal and external priorities (fig. 1b). The press-product association, even though studied at the design stage using numerical simulation tools, has now to pass into practical application and this implies the complete knowledge of the real (not simulated) potential of the plant and the translation of these notions into a numerical routine.

The management system has to know the pressure die casting machinery as its 'children' and so the sampling phase can be used not only for the production of the first prototypes but also as the instructions and 'educational' phase. An adequate set of process parameters (DoE - fig. 2a) and the consequent automatic acquisition of the outputs, via PLC, provides the discrete base for the construction of the so-called response surface methods (RSM) that represent the numerical version of the real production process. It is then possible to generate the optimal RSM that covers every point of the set of ideal parameters for production, with one parameter for each quality objective/indices proposed.
It is also possible to define a superior or lower RSM of the product quality limits (fig. 2b). The hyperspace continuum (not discreet) of the variables within the upper and lower quality limits are compared with the production data in real time for an immediate evaluation of the quality level and any automatic scrapping of a non-conforming piece that does not, therefore, continue on the line for finishing and packaging. modeFRONTIER's set of response surface methods set is all the more reliable the more the sampling is done in strict compliance with the defined DoE.

The monitoring of production files provides new input for the fine tuning and updating of the RSM. The system that verifies a wrong set of parameters must not only reject the nonconforming piece but also any reaction on the variables that are the cause of the problem so as to return to the pre-established quality range. If, for example, the cast presents cold joints or lack of filling, the software checks if the times and speeds of injection have changed or if the die heat balance has changed and, in consequence, acts on the injection or heat regulation and lubrication systems. There is no limit to the order book and the associated data that can be archived and thus used for statistical analyses for the definition of routine and extraordinary maintenance programmes in relation to the fatigue life of single components or parts of the structure. The work flow and corresponding production control can be summarized as follows:

- order acquisition from the company system and distribution of work to the compatible machinery,
- definition of sampling (DoE) for the generation of the response surface methods (RSM),
- analysis of sensitivity and correlations between input and output,
- exportation of RSM to numerical routines for the control of production,
- monitoring of production and any corrections,
- monitoring of production and updating of Response Surface Methods,
- statistical and cost analyses of production.

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ES.TEC.O becomes a Product Partner of the Mathworks Connections Program

MATLAB seamlessly integrated into modeFRONTIER's Multi-Objective Optimization and Design Environment

ES.TEC.O srl, a leader in multi-disciplinary optimization software, today announced that it has become a member of The MathWorks Connections Program. This partnership is based on the easy-to-use Direct Integration interface between The MathWorks' flagship product, MATLAB, and ES.TEC.O's modeFRONTIER.

The MathWorks Connections Program is available to third-party organizations that develop and distribute complementary, commercially available products and services based on the MATLAB technical computing environment.
Connections Program partners help MATLAB users by providing industry or application-specific technology to fill their need for a complete solution. Partner products offer solutions that are seamlessly integrated with MathWorks products and ensure ongoing compatibility in conjunction with new MATLAB releases.

"We are very pleased to be a part of The MathWorks Connections Program," said Carlo Poloni, President of ES.TEC.O. "This is a key opportunity that will allow us to offer better support and a better product to the wide community of engineers and scientists who use MATLAB to simulate their products. It will allow us to further penetrate challenging industrial sectors ranging from aerospace to consumer products wherever product quality is a must and where multidisciplinary analysis and optimization gives competitive advantages. We really look forward to the many opportunities that this partnership will bring us."

modeFRONTIER provides users of MATLAB with a multi-objective optimization tool which allows them to couple their multi-physics solvers in a multi-disciplinary design environment by exchanging results with other software packages. Once the user has defined design parameters and specified objectives, the whole process, including the automated launching of all components, is driven by modeFRONTIER, using a variety of state-of-the-art optimization techniques. These range from gradient-based methods and Simplex to genetic algorithms and Game Theory

About The MathWorks, Inc.
The MathWorks is the world's leading developer of technical computing software for engineers and scientists in industry, government, and education. With an extensive product set based on MATLAB® and Simulink®, The MathWorks provides software and services to solve challenging problems and accelerate innovation in automotive, aerospace, communications, financial services, biotechnology, electronics, instrumentation, process, and other industries. The MathWorks was founded in 1984 and employs more than 1000 people worldwide, with headquarters in Natick, Massachusetts.

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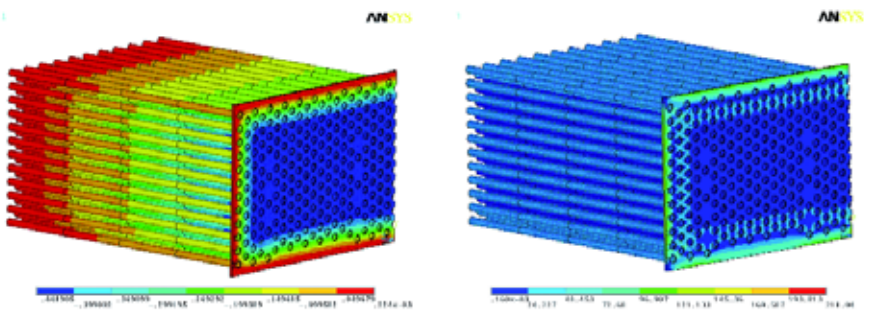
Dispatches

EnginSoft and ANSYS in the study of pressure equipment

By tradition, one of the areas where CAE is most widely employed is in the design and production of structures and components subject to internal pressure for which the potential risks linked to structural failure can result in dangerous direct hazards such as explosions or shock waves, or indirect impacts including leaks and the dispersion of dangerous materials. The need for special attention to safety factors is therefore evident.

The design of equipment of this type is, consequently, subject to conformity with the obligations imposed by local and international standards which set the minimum requirements for structural resistance that the design has to respect for the component to be acceptable.
The design is calculated to conform to the required standard by the application of either the design by code approach, with which design is tested against the minimum dimensions requested by the standard, or the design by analysis method, where a more realistic approach is adopted with the application of CAE (typically FEA).

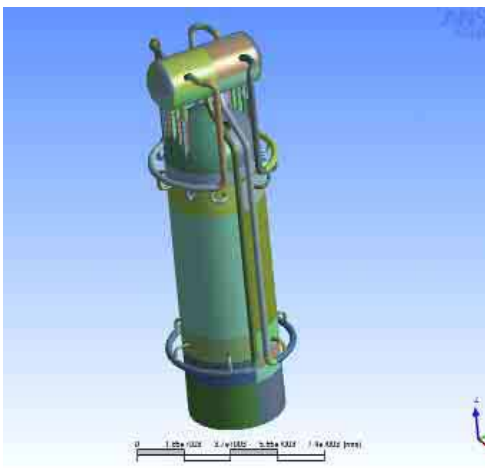
These approaches to standards conformity are typical of the chemical, process and energy industries but they also find applicationin less obvious sectors such as those linked to the construction of machinery with compressed air circuits, heating systems, etc.



Thermo-mechanical stress analysis on the tubesheet of a S&T heat exchanger

For these applications, EnginSoft has for years been a key industry partner in the supply of a complete solution for all the needs of its customers. The company can supply bench mark simulation technologies (ANSYS/CFX), with features that make the simulation of the design needs of the sector easy to simulate. These range from the evaluation of heat exchange balanced to fluid-structure interactions, and the calculation of stress analysis including the effects of pressure, heat stress and external loads, in addition to making the aggregated results immediately available in the form required by the standard in question, for example the linearization and classification of tensions.

In addition, the team of EnginSoft engineers can boast a long and well documented experience in the sector in which it has worked for years providing consultancy services to leading companies that include Snam Progetti, Nuovo Pignone, Foster Wheeler, Tecnimont, Imar and others. A wide range of work has been undertaken for these companies including detailed analyses of heat exchange in heat exchangers, evaluation of the effects due to flows caused by structural and dynamic reactions, and optimization of structural characteristics and the insulation needed to reduce thermal stress.

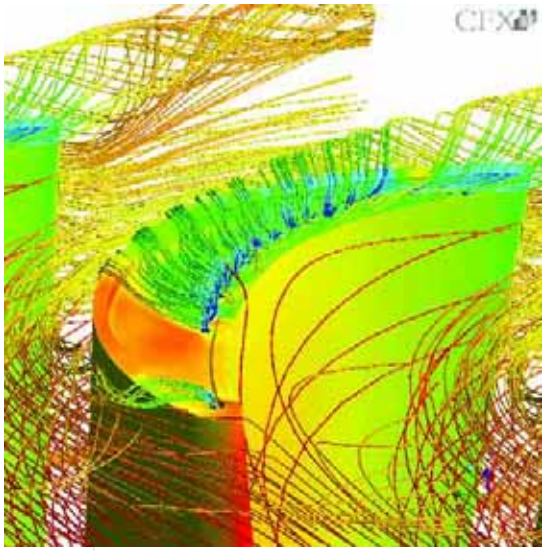


EnginSoft specialists are able to take on projects such as those listed above from the creation of the models with the complexity and accuracy required by the specific case in hand to the provision of the documentation for presentation to the certification and control body for the standards of interest.

Thermo-mechanical stress analysis on the tubesheet of a S&T heat exchanger

Thematics Deepenings

Optimization Techniques Applied to the Design of Gas Turbine Blades Cooling Systems

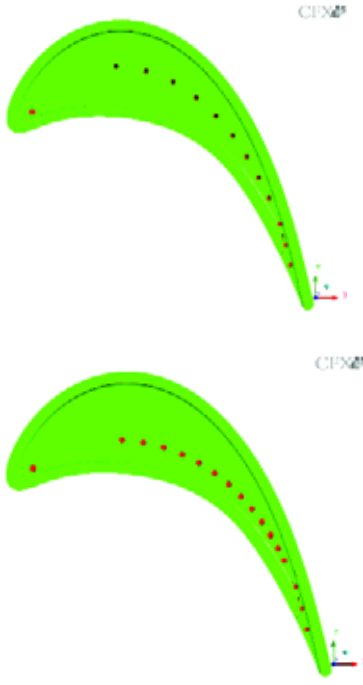


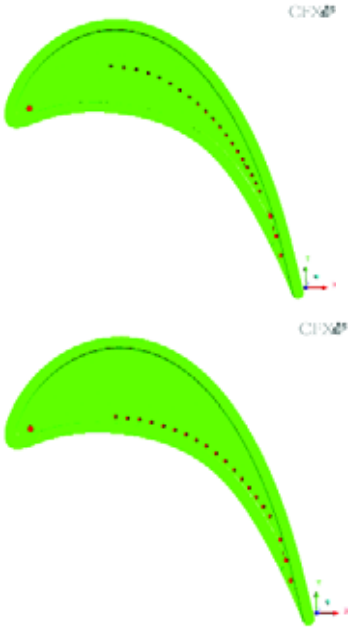
A novel methodology has been used to design the layout of the tip cooling nozzles of a high pressure rotor blade turbine.
The methodology used is through a complete CAE approach, by means of a parametric CFD model which is run many times for the exploration of several designs by an optimizer.
Hence the design is carried out automatically by parallel computations, with the optimization algorithms taking the decisions rather than the design engineer. The engineer instead takes decision regarding the physical settings of the CFD model to employ, the number and the extension of the geometrical parameters of the blade tip holes and the optimization algorithms to be employed.
The final design of the tip cooling geometry found by the optimizer proved to be better than the base design (which used mean values of all input parameters) and also better than the design proposed by an experienced heat transfer AVIO engineer, who used standard best practice methods.
Furthermore the large number of experiences gained by the several simulations run by the optimizer generated a virtual database of tip cooling configurations, allowing the designer to find laws, functions and correlation between input parameters and performance output, with a further and deeper insight into this specific design blade cooling problem.

METHODOLOGY

This study is part of an AVIO project concerning the development of High Pressure Turbine blades with advanced cooling systems. Due to the high gas temperatures entering the turbine of the most recent aero-engines in general up to 2000 K at the turbine inlet at 40 bars, a very efficient cooling system is required in order to maintain the metal temperatures below the allowable limits. This means to use a certain amount of "cold" air directly extracted from the compressor, with a significant negative impact on the engine performance.

One of the most critical area, from a thermal point of view, is the tip region of the unshrouded rotor blades. Tip regions are generally cooled using rotor internal air ejected in the flow path through a series of small holes located in the tip surfaces. The ejected air must cover all the surfaces in order to create a cold film between the hot gas and the metal. As the tip region is characterized by a very complex 3D flow field, it is very difficult to optimize the cooling system using the standard design methodologies, also considering the other blade tip requirements such as minimising the hot leakage air from pressure to suction side, which has a negative impact on turbine aerodynamic efficiency.
For these reasons the area of the tip is investigated with a parametric CFD approach: a parametric model is run several times guided by an optimization algorithm, such that an optimal solution in terms of performance can be found. This kind of approach requires to link an



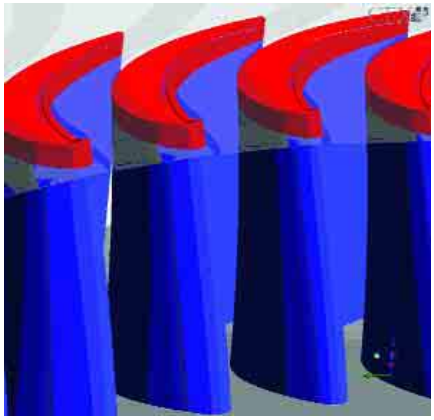


Case Studies

optimization software (modeFRONTIER) to a 3/D CFD code (ICEM-CFX5) with the goal to find the optimal values of some geometrical parameters of the tip area of the high pressure rotor blade, such that certain performance objectives are reached. As a consequence of the geometrical complexity of the problem and of the high computational time, the use of the interpolators or expert system techniques becomes compulsory if a 3/D fluid-dynamic optimization has to be approached.
Several methods are generally available within optimization software: RSM, ANN, etc. In this case a ANN method was chosen because of the nonlinearity of the system.

BLADE CASCADE

This way, after a preliminary series of CFD analyses and after the estimation of ANN, the 3/D CFD model can be substituted by a series of mathematical functions and the computational time is considerably reduced. The expert system, represented by a ANN, must be introduced after a fair number of analysis are run, such that the expert system is reliable. The error of the expert system is a known value and is the parameter which yields the



accuracy of the interpolator relative to the database of real experiments so far acquired. It is up to the designer to chose the threshold error value of his expert system. Basically more CFD analysis we run, the more trained and the more accurate the expert system becomes, but with an increase of the CPU effort, and viceversa. A parametric batch procedure allows the creation of different geometrical models, the mesh generation and the CFD analyses of the blades in an automatic way. A series of preliminary CFD simulations is planned and a screening is performed in order to build an input-output database.
ANN coefficients for the two layers are calculated by the optimizer. A MOGA algorithm investigates runs with further CFD "Virtual" analysis, exploring the space of possible solutions on the ANN. Basically a virtual optimization of the cooling system is carried out without further CPU expensive CFD analysis.
The best virtual solutions are selected and the ANN virtual solutions are validated by a "real" CFD analysis.
More accurate Neural Nets can now be estimated with a larger database. The virtual optimization can be executed again and new and more performing designs can be found. This procedure is repeated till the desired convergence to the set of optimal solutions is achieved. Finally a layout of tip cooling nozzles is found by the optimizer and validated by a CFD analysis. The final design chosen proved to yield the same heat transfer performance with a reduction of approximated 16% of the cooling air required. Hence we can conlcude that a remarkable increase of performance of 16% is obtained thanks to an innovative complete CAE design process with CFD parametic models evolved by optimization algorithms.

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NAFEMS World Congress 2007

May 22-25, 2007 in Vancouver, Canada

NAFEMS is an independent not-for-profit body with the sole aim of promoting the effective use of engineering simulation methods such as finite element analysis, multibody system dynamics and computational fluid dynamics.
The NAFEMS World Congress will be the International Congress on Simulation Technology for the Engineering Analysis Community.
This conference will bring together world leading industrial practitioners, consultancies, academic researchers and software developers with a common interest in engineering analysis.

Simulation is now established in many engineering companies as part of their product development process. Whilst the conference will cover many aspects of the use of simulation, a particular focus will be how the appropriate deployment of simulation can lead to a further competitive advantage through helping to stimulate innovation.
Held at the Westin Bayshore Hotel in Vancouver, Canada, on May 22nd-25th 2007, the NAFEMS World Congress 2007 is easily accessible from across the globe.
EnginSoft will be contributing to the conference with a presentation onLINFLOW, Fluid Structure Interaction (FSI) software.
For further information:
www.nafems.org/congress

Case Studies

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EnginSoft participates in the "IRCOBI Biomechanics Course at the 2nd Young APSN Conference"

Warsaw University of Technology, Warsaw, Poland - 12-14 June 2006

EnginSoft took part in the second "Young APSN Conference", organized by ViSEB Lab, Warsaw University of Technology (WUT) on 14th June.

APSN (Advanced Passive Safety Network), of which EnginSoft is a member, is a network of over 50 European partners working in the field of Vehicle Passive Safety (automotive companies, producers of safety systems, service companies, research institutes and universities), with the objective of activating the scientific and market expertise involved in the sector so as to increase levels of road safety at costs that are acceptable to both the individual and European society as a whole.

The idea of the conference was to offer young researchers working in the field of road safety an occasion to meet at an event that could favour an exchange of different experiences and to present and promote research activities.

The conference was preceded by the "IRCOBI Biomechanics Course", which allowed participants to extend and deepen their knowledge of the biomechanics of impact. EnginSoft is involved in the development and improvement road safety through its competences in the fields of CAE, optimization and virtual prototyping. In particular, the activity that EnginSoft has conducted in the fields of crash and fast dynamics which matched perfectly with the subjects under discussion during the three days in Warsaw. The themes covered spanned injury scaling to the anatomy of the human body (head, neck, chest and abdomen) as evaluated in the context of road accidents, the physical mechanism associated with injury and the critical numbers that define the causes of such injuries to the use of dummies for safety testing and the development of bio-mechanical models for impact tests.

The Polish event provided EnginSoft with an occasion to consolidate its position in a key sector for the harmonisation of standards within the European community and to promote awareness of the support it can provide to companies working in different ways in the sector of passive safety, and how EnginSoft can become an ideal partner for the creation of positive synergies.

With the objective of providing ever more closely targeted, quality service, EnginSoft also continues with its own research policy for avant-garde numerical solutions that, in the context of road safety are provided by the following tools:

- LS-DYNA (LSTC), codes to the finished elements for the analysis of fast dynamics;
- VPG/Safety (ETA) module, the environment able to create, manage and process complex models for the simulation of vehicle impacts;
- AnyBody (AnyBody Technology A/S), software for modelling the mechanics of the human body;
- modeFRONTIER, multidisciplinary and multi-objective design platform.

EnginSoft plays an active role in the 9th International LS-DYNA Users Conference, in June 2006 in Detroit

Once again, EnginSoft was invited to take an active role at the conference by reporting on its experiences of strictly industrial applications, this time relating to the simulation of the fast dynamics phenomena. The subject chosen for this edition of the conference, was the work performed together with Omega Srl, Research and Innovation Centre, on the development of a new structural design methodology for motorbike crash helmets.

The declared objective was to introduce technical and technological innovations to the mass produced protective products that are the key players in protecting human health, and it was sought by exploiting the synergies of obtainable from the experience of numerical simulations with EnginSoft's own LS-DYNA codes and the experimental capacities of the Omega group's test laboratories. The approach adopted led to the analysis of the structural behaviour of various sample structures obtained using sandwich technology. modeFRONTIER piloted all the activities and managed the enormous quantity of data sourced by distinct disciplines that were numerical for the simulations and practical for the laboratory tests. The decision support tools and genetic algorithms available in the modeFRONTIER working environment were applied in two phases. The first phase focused on calibration and understanding of the effects of the numeric parameters of the model and the mechanical parameters of the materials used in order to represent, and so forecast with complete confidence, the crash behaviour of the structure made out of the sandwich composite. The second phase regarded the analysis and subsequent optimization of the complete helmet 'system' subject to the impact conditions imposed by current standards. modeFRONTIER's multi-objective optimization genetic algorithms were used to achieve the best structural performance and the lowest possible weight. The presentation given during the conference, which was attended by some 650 delegates from all over the world, raised enormous interest because of the industrial efficacy of the methodology proposed and for the possible applications in other fields with different objectives, and even the reduction of computation times of LS-DYNA or robust design processes.

Design of the Brenner Base Tunnel with modeFRONTIER

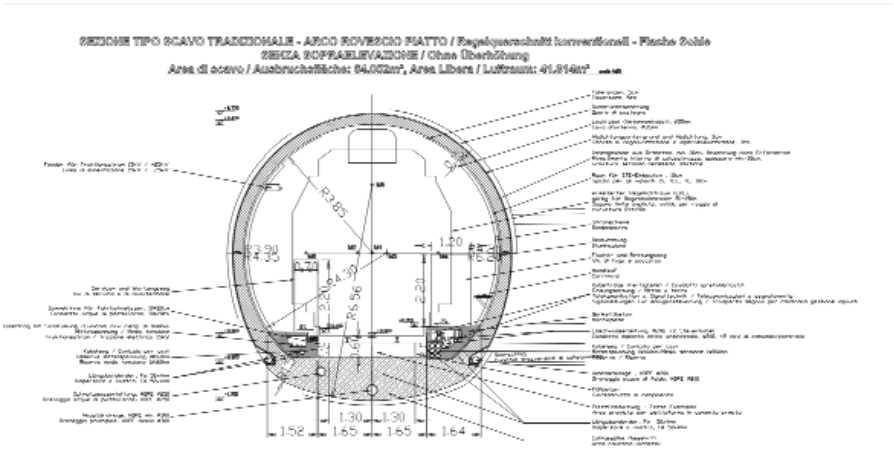
The optimization software applied to civil engineering

The Brenner Base railway tunnel through the Alps is one of the greatest construction projects of the 21st century, with two single track railway tunnels connecting Fortezza in Italy to Innsbruck in Austria. The tunnel will have a 72.4 m2 section and be 56 km in length as it runs up to 1650 metres under the Alps. The two rail tunnels will be about 70 metres apart and joined every 333 meters by connecting galleries. Trains will be able to change tunnels in multifunctional depots at Prati, Steinach and Innsbruck. These depots will also house ventilation equipment, technical infrastructure and safety and signalling systems, as well as two emergency stations directly linked by separate access tunnels.

Passing from south to north, the tunnel will be drilled mostly through granite, paragneiss, schist, gneiss, marble, schist and phyllite. An interesting geological feature of the project is the crossing of the Periadriatic Seam, caused by the collision of the African plate and the European continent.

Cross section

Each single track tunnel will be drilled a 9.6 meter wide and will also house all the safety, signalling and telecommunications equipment. A gravity drainage system will be designed in a service tunnel running between the two rail tunnels. A safety by-pass will be constructed every 333 metres along the length of the



structure providing an emergency escape route as well as equipment rooms.

Multi-functional depots

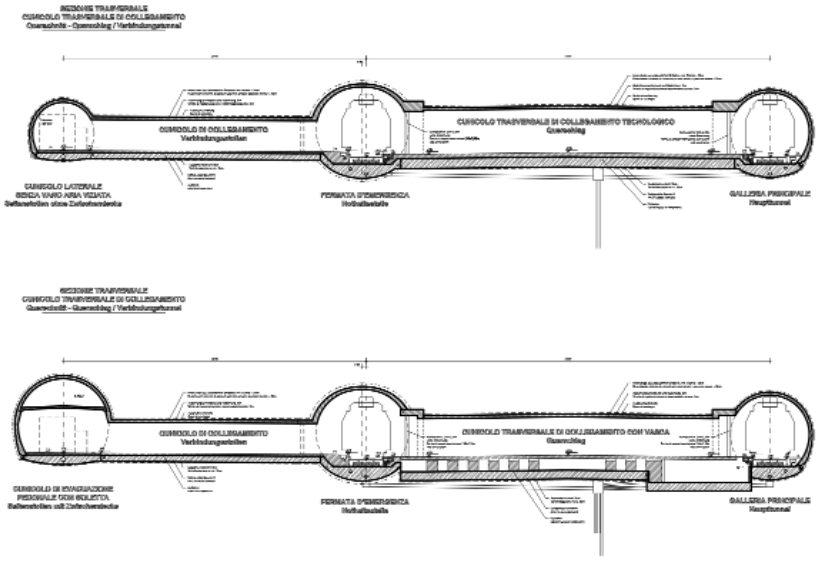
Tunnel safety is based on the construction of multifunctional depots sited at not more than 20 km one from the other. These will feature safety galleries that, as well as providing ventilation, will be used for evacuation in the case of an emergency.

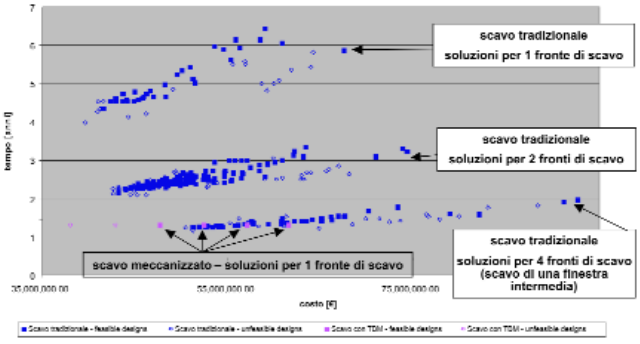
Design Analysis

The investigation to identify all the possible phenomena associated with excavating at great depth has called for the ample use of analytical models. Subsequently, the design complexity of such a project has demanded bidimentional FEM modelling in the more critical sections as well as in the design of the multifunctional depots.

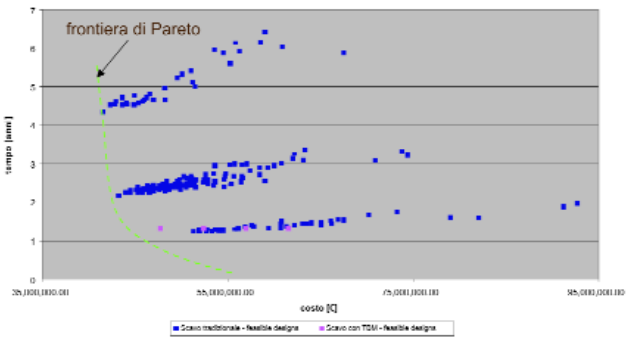
modeFRONTIER: developments in tunnel engineering

The Brenner Base railway tunnel presented its designers with some problems of notable interest. The major unknown in this type of study is the uncertainty of the data that have to be used in the models used to simulate the mechanical behaviour of the rock mass at the considerable depth reached by the tunnel.
In such a context the use of deterministic approach is not always





Traditional excavation vs TBM (L=5600 m)

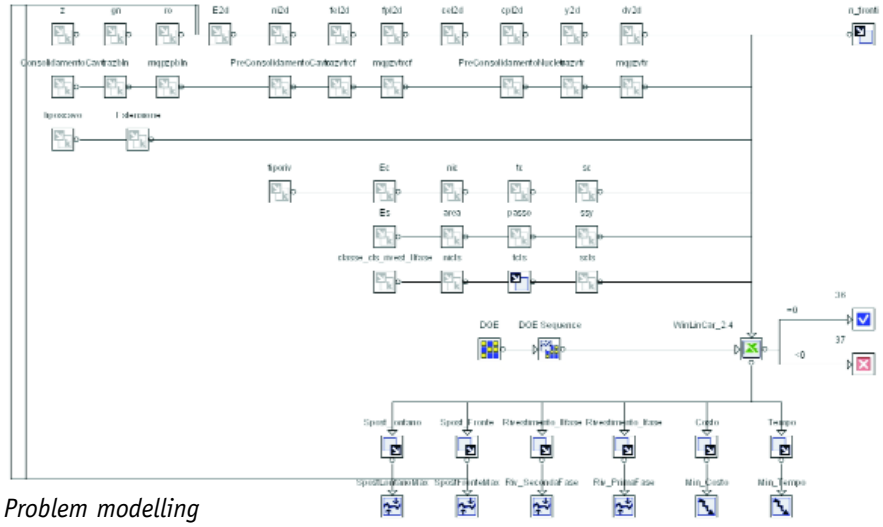


Traditional excavation vs TBM (Optimal solutions and Pareto frontier)

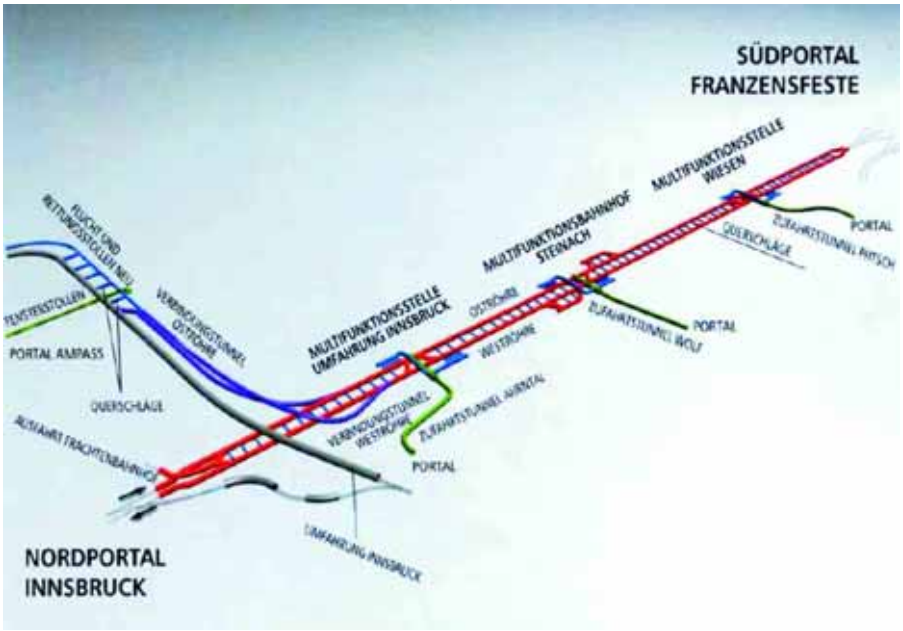
adequate because of the unknowns relating to the estimation of the fixed parameters of the behaviour models, as well as the uncertainties inherent the behaviour model itself. Because of this, a probabilistic approach is more fruitful in a problem that presents numerous uncertainties, such as that of designing the Brenner tunnel, given the variability of the rock formations, the behaviour of the rock mass and, as already mentioned, the parameters of the behaviour model.

modeFRONTIER is an advanced tool able to support the designer in the analysis and decision process in the presence of uncertainty.
modeFRONTIER checks the way the responses in the models which simulate the mechanical behaviour of the rock mass vary with all their input parameters, informing the designer of the unknowns that have the greatest impact of the response of the rock mass.

This process is accompanied by a large number of graphics that can be easily generated by the software and which assist in the full appreciation of the behaviour of the mass during boring.
The use of modeFrontier in the design of the Brenner tunnel has allowed its designers to follow a decisional process that has led to the optimization of design choices thanks to the statistical analysis of the variability of the geological parameters and the use of graphics that assist the understanding of the physics of the phenomena being studied.



Problem modelling



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Case Studies

28-29 September 2006
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06
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the aim of the conference

To stay competitive and gain market share, companies are forced to continuously improve the quality of their products. While this has been a longtime-held belief for most managers, only in recent years has it become clear that achieving higher quality is not necessarily at odds with eorts to reduce cost and time-to-market.

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